ELECTRICAL REVIEW

15th FEBRUARY 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CL • NO. 3873

Research Finance

FOR some time now the Electrical Research Association has not had at its disposal any real working capital, or adequate laboratory room in which to pursue its investigations. Notwithstanding the economies which have been made and the reduction, or deferment, of a number of well-supported requests for research, the Association has had to work up to the full limit of its annual income.

We extend our sincere condolence to the Royal Family in the great loss which they and the British people have sustained by the death of His Majesty King George VI. We offer our loyal tribute to Her Majesty the Queen upon her accession to the throne

As was foreshadowed a year ago, the fresh agreement then being negotiated for larger Government grants-in-aid, in accordance with the usual quinquennial adjustment by the Department of Scientific and Industrial Research, has meant that the E.R.A. must begin to enlarge its grant-earning income from industry. Members have already been asked to raise their subscriptions by 20 per cent. If this appeal succeeds the £140,000 which may be collected in the current financial year (1951–52) could earn a grant of £70,000, so totalling £20,000 more, with grant, than the sum received in respect of 1950–51.

The Industrial Grants Committee of the D.S.I.R. does not, however, consider the proportion of electrical research which is done co-operatively (and is at present costing more than £200,000 a year) to be commensurate either with the magnitude or with the importance of the industry.. The aim therefore is further to enlarge the scale during the next three years with the hope that £170,000 may be subscribed in 1953–54 in order to qualify for the maximum grant of £100,000. Members' support in this way can avert any risk that the continued existence of the Association

will be prejudiced by a fall of grant-earning income. Concurrently the long-planned proposals to build new laboratories at Leatherhead on a site acquired some years ago, to replace the inadequate Perivale premises, now seem likely to proceed. The project is estimated to cost £400,000. If members will collectively contribute one-half that sum, the E.R.A. Council feels confident that it can secure one-quarter from the Association's reserves for building and the remaining quarter from a D.S.I.R. special grant. The response so far in the relatively short time since the two appeals were launched has been encouraging. Indeed the chairman of the Council feels " quite sure " that the outcome will be satisfactory and at least remove any immediate need to prune co-operative electrical research further.

HOUSING ESTATES

Mr. F. G. Copland's I.E.E. paper on supplies to new housing estates (reported in this issue) provided a good example of the modern trend towards using research data to create a model framework for a scheme of development. The method allows plenty of scope to engineering experience in its application to particular circumstances. It also entails the forecasting of conditions in a problematical future, so considerable flexibility is essential. During an animated discussion doubt was thrown on the soundness of a scheme which envisaged the expenditure of capital at the outset that would meet the conditions estimated as obtaining as far ahead as forty years. The method of approach of the author, however, appears to us to be correct.

LARGEST CONSUMER?

Before waste heat from uranium or thorium reactors becomes available for driving steam or gas turbo-generators in public supply stations, the atomic energy processes themselves are likely to consume more electricity than they can produce. So much can be deduced from a statement in *Electrical Engineering* by Mr. T. K. Glennan, of the United States Atomic Energy Commission, that the Commission will be beyond comparison the largest single user of electricity from the public mains. It appears, therefore, that no early or inexpensive relief to generating plant problems in Great Britain is to be expected from " atomic power "—rather the contrary.

BOARD SELLS BUSES

When the South Wales Electricity Board took over the undertaking of the Llanelly and District Electric Supply Co., it acquired a small street transport system. Recognizing that its proper job is selling electricity, the Board has decided to divest itself of the 26 trolley-buses and 15 petrol buses which it has been operating. An agreement has been reached for the sale of the system to the South Wales Transport Co. It will be a pity if the Board loses the electrical load as well—it has been hinted that the new owners may at some future date operate the services wholly with petrol buses.

METER CERTIFICATION

In 1936, as the result of a Court case, the Electricity Supply (Meters) Act was passed. By this it was made legal to use, until 1st July, 1948, " uncertified " meters, which was previously contrary to law, although that law was more honoured in the breach than in the observance. Because of the war it became impossible to replace all existing uncertified meters by the specified date and the period was extended for five years. As it seems that even by that time the changing of meters cannot be completed a further extension of five years is being made. Since the 1936 Act was passed, however, a large proportion of meters have been exchanged for certified ones and all new meters have been certified. About a quarter of the meters now in use have not been certified.

DRAKELOW GENERATING CENTRE

Station "A" of 240 MW Capacity for Unit Operation

GOOD headway has been made in the construction of the Drakelow "A" power station of the Midlands Division of the British Electricity Authority. In particular this has been due to the earlier work of site levelling and overburden handling which were carried out at an exceptionally high speed in consequence of the use of special plant by the main civil engineering contractors, Sir Robert McAlpine & Sons (Midlands), Ltd.

During a recent visit to the site Mr. F. W. Lawton, Midlands Division Controller, paid a high tribute to the civil contractors for the speedy progress they had made, and the constructional engineers generally voiced the impression that it had been due mainly to careful planning of the layout of the constructional plant in the first place, particularly the strategic siting of the erection cranes, so that any and every part of the structures could be reached readily at any time. Of course, the Division must have been fortunate at some time in receiving the quantities of structural steel so far used on site.

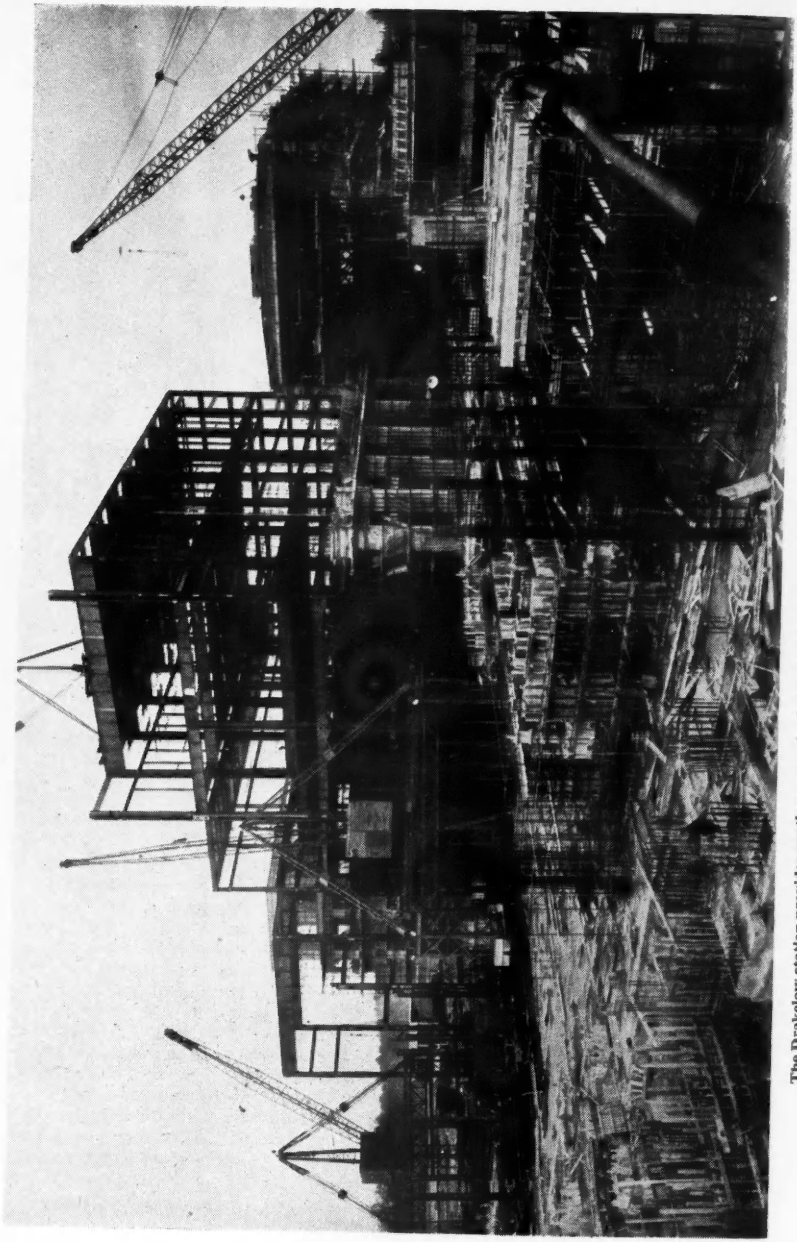
Excavations began in June, 1950, the foundations were commenced in October, 1950, and now considerable sections of the boiler house and turbine house are sufficiently advanced to receive some of the generating plant.

Although none of this is yet on site, the boiler house steel framework is about half erected; the turbine house is fully completed with walls and roof to the extent that No. 1 turbo-alternator foundation block at the south-east end is fully covered, while the rest of the turbine house construction tails off in respect of the stage of construction throughout practically its complete length of about 600ft. All four turbo-alternator blocks are nearly completed, and No. 4 block at the north-west end is almost completely exposed.

The site has been excavated to an average depth of 6ft, thus affording a mean level for both the "A" and "B" stations, reducing the depth of the main foundations and providing the necessary material for embankments for the railway sidings.

Drakelow "A" has a note in common with the last B.E.A. station we dealt with at the constructional stage, namely.

The River Trent, seen above, offers a very variable yield, so the station is to represent mixed riverside and cooling tower operation



The Drakelow station provides another example of dual building construction—reinforced concrete and all-steel framework

Acton Lane "B," London Division (see *Electrical Review*, 18th January) in that while the boiler house building has an all-steel framework its adjacent turbine house is being constructed in reinforced concrete. In this case, however, the concrete construction is being carried out on site.

The power station site is part of the Drakelow Park Estate about two miles from Burton-on-Trent. The Leicester–Burton railway forms a boundary on the north-east and the Walton–Burton road is approximately a south-east boundary. About a mile south-west of the railway the River Trent bends to form a sharp southerly dip and it is just below this point where the major buildings lie.

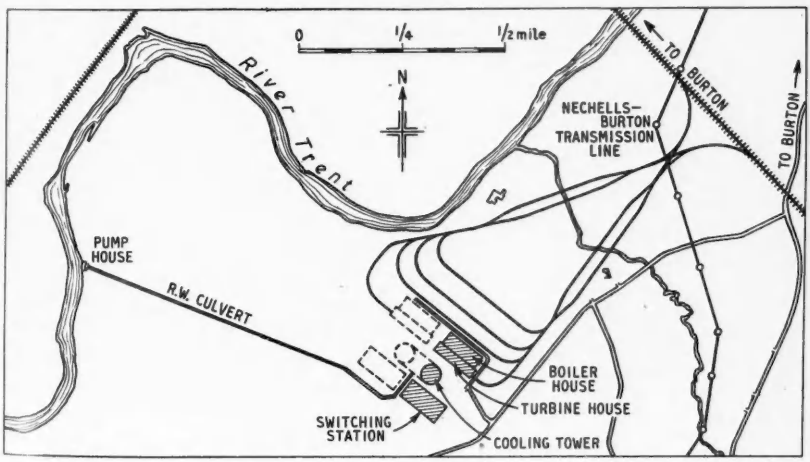
The main buildings of Drakelow "A" and the future Drakelow "B" are aligned south-east to north-west. The boiler house of the "A" station lies on the north-east side of the adjacent and parallel turbine house. A few hundred yards south-west of the turbine house is the new 132 kV switching station, the civil engineering part of which is now almost complete. The reinforced concrete supporting members for the isolators, etc., in this switching station were precast on site. This switching station will be aligned with a future 275 kV switching station in similar directions to the main "A" and "B" station buildings.

Between the major buildings and the switching stations, the first of a number of cooling towers is now in the early stages of construction and it and the future towers will be aligned in the same directions as the main buildings and the switching stations.

While it is not our intention fully to describe here this particularly interesting generating centre from the operational aspect, we can add some interest by referring to the plant layout in terms of the operation of circuits and cycles, etc.

Station "A" will have a total generating plant capacity of 240 MW in four 60 MW turbo-alternator sets (English Electric Co., Ltd.), and the steaming conditions of 1,500 lb/sq in and 1,050 deg F will probably represent the most advanced yet in public electricity supply in this country. While the complete design for station "B" has not yet been evolved, we learned during our visit that it has now been decided that the second station will have a generating plant capacity of 400 MW in four 100 MW sets with correspondingly larger boilers. The steaming conditions will be rather different for it has also been decided that re-heating of the steam exhausted from the high pressure stage of the turbines will be adopted. The initial steam temperature will be rather lower than for station "A" and a little lower than 1,000 deg F.

The station site is part of Drakelow Park Estate and is bounded on the north-east by the Leicester–Burton railway and on the south-east by the Burton–Walton road; the main buildings are almost due south of and near the southerly bend of the River Trent which constitutes another boundary in the north and north-west



Apart from the altered steam conditions and the larger major machines and plant, the pattern of station " B " will follow that of station " A " very largely, so that from now on in this article we can confine our attention to station " A."

The fuel circuit embraces a triangular system of railway sidings to the north-east of the site with connections to the Leicester–Burton railway about a mile away, in such a way that British Railways locomotives can draw coal trains right into the " fulls " sidings, reverse and pick up the empty wagons.

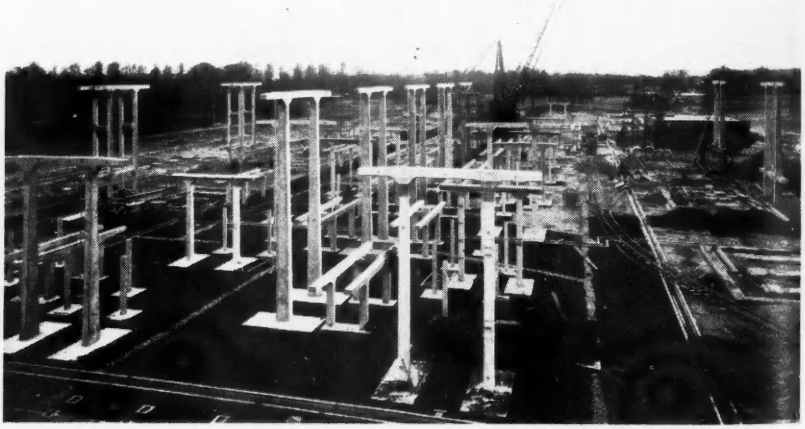
The coal handling plant (Mitchell Engineering, Ltd.) will incorporate four 24 ton wagon tipplers, bucket elevators and horizontal and inclined belt conveyors for delivering the coal to the bunkers which will be disposed at the sides of the upper parts of the boilers and over the coal pulverizing mills, in consequence of automatic boiler control being adopted. For reclaiming and distribution the coal store will be spanned by a 188ft transporter.

From the above it is obvious that the boilers will be pulverized fuel fired and each boiler, which is of the " Lopulco " three-drum radiant type, is designed to evaporate 515,000 lb of steam an hour at 1,060 deg F, and is unit coupled to its corresponding 60 MW turbo-alternator. Four " Lopulco " p.f. mills serve each boiler, and each mill is equipped with a Keith Blackman exhauster fan. The powdered coal is passed in an air stream on to the corner burners of the rectangular combustion chamber. These burners contribute to the automatic firing scheme in that control of the final steam temperature is automatically maintained within plus or minus 10 deg F by altering the vertical angle of tilt of the burners, so that raising or lowering of the flame mass reduces or increases the furnace cooling surface presented to the gases. The design of the International Combustion boilers is based on the use of low grade Midland fuel (8,770 B.Th.U./lb) with 21·5 per cent ash content. Oil fuel is used for starting up purposes, Wallsend pumping and heating equipment being provided for this purpose.

International Combustion equipment is installed for handling the waste from the fuel after combustion and the ash handling system employs gravity sluices inside the building to an ash pump house in which are located vertical spindle pumps for elevating the slurry to a gantry which carries the troughs to the ash disposal area on the low lying ground in the loop of the river.

In the air circuit two Davidson forced draught fans deliver air to Howden Ljungstrom air preheaters from which the majority of the air is delivered as secondary air to the combustion chamber via ports around the burners. Some of the air is drawn from the f.d. fan circuit and taken direct to the mills to provide the air conveying stream to the burners.

From the civil engineering aspect the 132 kV switching station is now almost complete



The turbine house building block is all of ferro-concrete framework construction

After passing through the boiler generating tube system, the superheaters and the economizer, the gases divide into two parallel and identical streams, each passing through one of the Ljungstrom regenerative air heaters, a Sturtevant electrostatic precipitator and a Davidson induced draught fan which finally passes the gases on to a brick chimney. The two chimneys for station "A," one for each pair of boilers, will rise to a total height of 360ft.

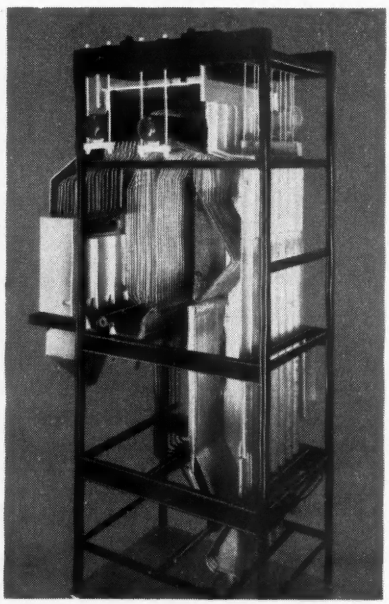
As the River Trent at this locality is contaminated and therefore not suitable for boiler feed make-up water, the heat cycle will start with two artesian wells which are being bored on site and will probably yield up to 320,000 gallons of water a day. After passing through suitable softening plant and treated-water reservoirs, the make-up water will be passed on to treated-water tanks in the station itself. Each boiler is served by two electrically driven

constant speed 100 per cent duty Weir feed water pumps which will deliver up to 650,000 lb/hr against 1,965 lb/sq in.

The boiler preheating feed water plant comprises two l.p. stages (one a de-aerator) and four h.p. stages, which results in a feed water temperature of 430 deg F. The feed water passes through twin "Heenan" all-welded type economizers and enters the feed drum at the rear of the boiler by multiple risers. After passing through the generating tube system, including the various wall headers and the mud drum, steam is finally delivered to the feed drum from the front steam drum. Superheating to 1,060 deg F is effected in the five series stages of the "Melesco" superheater.

Because of the unusual heat drop available as the result of the named steaming conditions, the heat cycle path in each of the turbines is arranged in three stages, namely, a short sturdy h.p. cylinder for the high temperature expansion, an intermediate pressure cylinder and an outward double flow l.p. cylinder suitably laid out to serve twin condensers (Worthington-Simpson), each of which is a twin shell unit.

The exceptional steam conditions of 1,550 lb/sq in and 1,060 deg F are afforded by the p.f. fired boilers; photograph of model



The heat cycle is completed by the transfer of the condensate to the feed heaters, of course, but in association there is a central evaporating plant for the whole station, comprising three sets of Atkinson triple effect evaporators of 25,000 lb/hr capacity.

As the River Trent in this district is shallow and sluggish in flow in dry weather it cannot be relied on always to yield the 8 million gallons of water per hour required for condenser cooling; hence an unusual arrangement of mixed riverside and cooling tower operation will be associated with what has hitherto been regarded as essentially base load operating conditions.

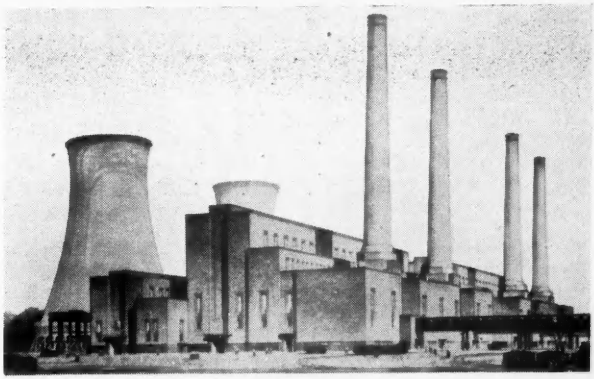
According to the river conditions the station may be run entirely on river water, entirely on the cooling towers, or on both. The water will be taken from the Trent at a pump house almost due west of the station buildings, where there will be four two-million g.p.h. Drysdale centrifugal pumps and Brackett screens at the riverside entry. A culvert will deliver the river water direct to the cooling towers pond system. The one cooling tower under construction (Mitchell Construction Co.) will provide for a water circulation of 3·8 million gall/hr, and the recooled temperature will be 76 deg F, average.

Each of the alternators will be arranged for hydrogen cooling, an axial flow fan at each end of the rotor circulating the hydrogen through the machine and coolers. The alternator exciter in each case will be separately motor driven and there will be a stand-by exciter for the complete station.

The alternators will generate at about 11 kV, but they will each be electrically tied to an English Electric 72 MVA 11·8/132 kV delta/star generator transformer. Through the 132 kV switching station already referred to these transformers will be connected to the 132 kV grid. The second switching station, which will be associated with the "B" generating station, will be connected to the forthcoming 275 kV transmission system. The 132 kV switchgear at present in manufacture, together with the station switchgear at 3·3 kV and 451 V, are being produced by A. Reyrolle & Co., Ltd.

The 132 kV outdoor switching station will have 15 bays for generator, station transformer and feeder circuits and a busbar coupler, and it will be of the double busbar type with 3,500 MVA air blast switchgear,

rem[illegible]ely controlled from the generating station main control room. For the general station supplies and stand-by supplies to the unit auxiliary transformer, there will be [illegible] MVA 132/3·3 kV station transformers. There will be [illegible] direct driven house alternator, the auxiliary supplies being provided in each unit by a 6 MVA 11[illegible]3·3 kV transformer directly connected to the alternator terminals. The worksauxiliaryswitchgear will be single busbar truck type air-break solenoid operated 150 MVA 3·3 kV and 25 MVA 415 V equipment.



Drakelow "A" will have a generating plant capacity of 240 MW and the "A" and "B" stations will eventually be aligned south-east to north-west

The tie-up between each boiler and its corresponding turbo-alternator set for unit operation in four axial lines through the station from south-west to north-east has resulted in what has become known as the Little Barford type of building with no partitioning walls between the turbine and boiler houses and the corresponding bays and annexes, and with all the major plant installed under a common roof.

The lengths of the various bays, etc., of the major buildings differ a little, but they are all around the 600ft figure. The turbine house proper is about 60ft wide, and the four sets are arranged in two pairs, Nos. 1 and 2 at the south-east end with the steam ends facing, and Nos. 3 and 4 at the other end in similar relationship. Each turbo-alternator set is about 80ft long, and the spacing between the steam ends of Nos. 1 and 2 sets and Nos. 3 and 4 sets is about 30ft. The spacing between the electrical ends of Nos. 2 and 3 sets is about 50ft.

A c.w. pump bay about 30ft wide flanks the turbine house on the south-west side, while a bay a few feet wider flanking the turbine house on the other side, i.e., between the turbine house and the boiler house, accommodates the boiler feed pumps and the feed water heaters. The boiler house is about 76ft wide and the centres longitudinally of Nos. 1 and 2 boilers and again of Nos. 3 and 4 boilers are about 176ft.

At site and basement level between each of these pairs of boilers are the two rows of p.f. mills at 58ft centres. Within these narrower limits between the p.f. mills, but at a level of 20ft above basement, is the 24ft wide firing or control aisle which extends through the boiler and turbine houses.

Flanking the boiler house on the north-east side is a bay containing the air pre-heaters and f.d. fans, about 30ft wide. Then there is a 25ft wide switch house in the same direction, and finally there is a 72ft wide bay on the extreme north-east in which are arranged the electrostatic precipitation plants and from which arise the two chimneys.

The axial centre line in respect of the buildings of each chimney is that of the corresponding firing aisle. On either side of each chimney are the two precipitation plants for each unit, and the two i.d. fans for each unit are housed in the precipitation plant bay, in each case between the chimney stools, so that there is a pair of i.d. fans on either side.

The turbine house roof level is about 75ft above site level, while the upper limit of the boiler house is approximately 145ft. The boiler steam drum centres are about 105ft above site level, and in this case, in particular because of the pulverized fuel firing and the peculiar boiler design, the boiler bunkers rise to a level somewhat lower than that of the steaming drums, while their vertical disposition is such that they are almost directly over the pulverized fuel mills. The precipitation plant building is about 72ft high.

Retiring Age and Economics

The Need for Revising Superannuation Schemes

By J. N. WAITE, C.B.E., M.I.E.E., F.Inst.F.

IN all civilized countries the expectation of life has been rising for many years. In this country it has advanced by about twenty years since 1900. Whereas in 1900 only 5 per cent of the total population were 65 years of age and over, in 1947 the proportion had risen to 10 per cent. It had doubled in 47 years. Thus the average age of the total population is increasing and, if the age of retirement remains constant and those over that age become non-producers, then the working population will have an increasing number of non-producers to support.

At the other end of the age-scale are children who are dependants. The proportion of the total population below the age of fifteen has fallen from 35 per cent in 1891 to 20 per cent in 1947, so that the ratio of productive workers to non-producers appears to have risen, but these figures do not reflect the true values of producers and non-producers. The modern tendency to extend the years devoted to education keeps many young persons from the ranks of producers until a much higher age than fifteen. In addition, the large fall in the percentage of young people practically ceased to operate many years ago and it appears unlikely to fall much below its present value. This, coupled with the tendency to devote more years to education, makes it probable that the proportion of dependants classed as children will not alter substantially for many years to come.

Cost of Pensions

There now appears to be general agreement that adequate pensions should be available to all who are no longer able to work to support themselves. To implement fully this desirable end means that the national and private expenditure to provide adequate pensions for all will be much greater than at present. Thus again the burden on the working producers is going to increase steadily.

Striking confirmation of the rise in the cost of pensions is provided by the fact that all the old superannuation schemes have been insolvent for many years and eventually will not be able to meet their liabilities unless the contributions to them are increased materially. In general, the old schemes were based on the average expectation of life at the time they were launched and on the expectation of salary and wage rates retaining the then existing levels. The total contribution from earnings was 10 per cent (5 per cent from the employee and 5 per cent from employer).

Increased Contributions

In the schemes being launched at the present time the total contribution from earnings has been fixed at 15 per cent so that the cost of providing the same relative value of pension has risen by 50 per cent.

The three main factors contributing to this increase are:—(*a*) Decrease of the yield of trustee stocks in which the funds are invested. (*b*) The large rise in the rate of salaries and wages over the span of working years. (*c*) Increased expectation of life, i.e., pensioners are living much longer than was the case when the original actuarial calculations were made.

In view of the fact that the expectation of life has increased by 20 years between 1900 and 1947, it is evident that this factor must have played an important part in increasing the cost of pensions. The fact that this increase is of the order of 50 per cent shows that it is time to resurvey the problem. Up to the present it has been accepted that 65 years of age is a proper age for compulsory retirement. It may be pointed out that if that was a proper age, say, fifty years ago, with the expectancy of life advanced by twenty years it is no longer so.

Opinions as to what ought to be done to meet the altered circumstances will be considerably influenced by whether full

employment is available to all who desire it, or whether substantial unemployment may occur again. At present we are in an era of full employment; if we premise that this will continue, then it is evident that any unnecessary shortening of the period of working years is bound to reduce the sum total of production and so will cause a reduction in the general standard of living. Putting it the opposite way, if the average span of working life is increased, then the "national cake" will be a larger one and, therefore, quite apart from disputes as to the size of the slice accorded to individuals, or groups of individuals, it is clearly to the advantage of the whole community that the "cake" shall be of the maximum size.

In the older superannuation schemes the maximum pension was settled at two-thirds of the average salary of the five years preceding retirement. In the modern schemes the maximum pension is half the salary preceding retirement, plus a lump sum. The financial effect approximates usually to nearly two-thirds of the salary. It thus seems that there is a consensus of opinion that a reasonable provision for old age lies between half and two-thirds of the salary at retirement. The National Health Scheme pension gives a value far below this, and it is expected that the movement towards an adequate old age pension will persist until the great majority are properly provided for.

Unions' Attitude

A year or two ago the writer took part in discussions with protective organizations representing staff, clerical and manual workers upon giving effect to the Government's request that all who could should be encouraged to stay at work after 65 instead of retiring. The Unions spoke with one voice and that was that they were prepared to consider any proposals only as a temporary measure and would not agree to any case where non-retirement impeded promotion. The latter requirement was quite impossible to meet and no agreement was reached. It appears that a reorientation of thought is very necessary.

From the foregoing it appears quite certain that the burden of making proper provision for old age is going to increase enormously and the main factor which will regulate the size of the burden is the age of retirement. It appears that, as the provision for old age must be made during the span of working years, the only practical way of keeping the burden from becoming unduly heavy is to advance the age of retirement to be consonant with the advance of the expectation of life. This conclusion cannot be escaped. Before effect can be given to it, many difficulties will have to be overcome and a survey of these may help in focusing ideas on the main essentials.

Burden Upon Production

It cannot be too strongly emphasized that the whole of the financial burden of pensions has to be provided from production and, therefore, in the long run, it is relatively unimportant what proportion is provided respectively by taxation, by deduction from earnings, or by employers. The sum total has to be borne by production and a full realization of the implications of that solid fact may save much argument.

The research unit of the Nuffield Foundation started investigations into the relationship between age and skill in 1946 and the first results have been published. Broadly, the conclusions were that the old idea that it was necessary to provide special light work for ageing manual workers was not valid save in a few special cases, especially if continuous effort was not required. Older people are suitable for operations requiring a high degree of accuracy. Skill is more easily maintained than acquired. This leads to the conclusion that the general policy should be to continue to use old manual workers on the job they are used to. There will be many cases in which special arrangements will be needed, but this does not detract from the general conclusion.

The last war showed to what extent the elderly could contribute to the national effort in an emergency. A survey showed that, of workers over pensionable age, 60 per cent were employed in their former capacities. They earned as much as the younger workers, absenteeism was not greater, and they needed less supervision. Some 40 per cent had to be found new jobs because of age. There is certainly a large field for manual workers to continue in their present jobs after 65. It seems likely that the same conclusion would be reached with clerical workers.

Technical and administrative staffs

operate under different conditions, where physical strength and stamina are much less important. As stated, the objection here is that their retention after 65 blocks promotion. This is true, but when a sectional interest conflicts with the general interest it is right for the sectional interest to give way. If persons holding responsible posts are physically and mentally fit to continue working after 65 years of age, then to ask them to accept some other post of lower status will only produce an indignant refusal in an overwhelming majority of cases. In addition, they can more easily give of their best in the job they are familiar with. The fetish of blocking promotion has its being and roots in plain selfishness and is not a worthy reason for preventing increased production.

If the population of this country desires to increase or even maintain its standard of living it must arrange to produce more goods and improve its services. In other words, it has either got to work harder or longer, or possibly both. No juggling with redistribution of income will alter this. One way of increasing total production is to increase the span of working years and it is quite time the country discarded procedure no longer suitable for the altered conditions.

It is quite clear that the old criterion of 65 years as a suitable age for compulsory retirement needs an upward revision. This may seem hard to the uprising generation, but it appears inescapable. It means that practically all superannuation and pension schemes will have to be amended. It will probably need legislative sanction to amend some, for they constitute legal rights and this country is generally not in favour of abrogating such if it can possibly be avoided.

So far the protective associations of organized labour appear to have refused to face the facts. This must result in an unnecessary reduction in the volume of production and, therefore, a reduction in the general standard of living.

In the interim period before the new standard age of retirement can become generally applicable it should be possible to reach agreement that those who have reached the present retiring age of 65 should continue to work if they are able and willing to do so. For those covered by existing contributory superannuation, or pension, schemes who have not reached the maximum pension rights, the additional service should count for an increase up to the maximum of the scheme. Those who will be entitled to the maximum pension on reaching 65 should have their pension ensured, but deferred until actual retirement. This would preserve reasonable equity compared with those qualifying under the new conditions. To deal with the fear of unemployment, it seems reasonable to suggest that unemployment pay should not be less than the maximum pension entitlement. This would put all employable persons on an equal footing and it would not matter whether young or old were in the available jobs.

Standard Specifications

THE issue of B.S. 1813 (price 2s, post free) has standardized, for interchangeability, three sizes of conduit dies with corresponding guides and stocks of the type used by electrical contractors; recommended screwing ranges of threads are included.

Round copper wires for winding coils for electrical machinery are the subject of two new specifications (price 2s each, post free): cotton covered sizes of from 0·006 to 0·192in diameter are dealt with in B.S. 1791 and oleo-resinous enamelled sizes of from 0·006 to 0·16in diameter, single and double cotton covered, are catered for by B.S. 1815. Neither document is applicable to wires which are braided or otherwise cotton covered.

Recently issued standard specifications for aircraft components include B.S. G.137 (price 1s, post free) for an extra-low-voltage d.c. flasher for rendering aircraft navigation light systems more conspicuous by alternately switching the lamp circuits. The device is designed to emit the light signals which the Air Registration Board requires aircraft in the United Kingdom to carry, but is adaptable to other national systems.

B.S. G.138 (price 1s, post free) is for ram switches operated by the air pressure created when the aircraft is in motion and intended for use in d.c. 112 V or 12 V circuits.

B.S. G.139 (price 1s, post free) is for a simple aircraft dashboard clock, spring-driven for eight days, indicating mean time.

These specifications are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1.

Light Industry in Ulster

Miniature Motors, Drawing Instruments and Stapling Machines

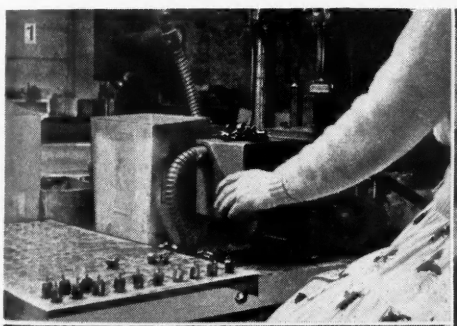
IN Northern Ireland the availability of electricity has made possible the establishment of a number of new light industries, several of which we have had a chance of inspecting recently. At Dunadry, Co. Antrim, B.M.C. Metal Products, Ltd., have converted an old bleach house to the manufacture of miniature electric motors and toys. Like many other manufacturers this company has been handicapped recently by shortages of raw materials, but normally it produces about 2,500 motors a day, some 450 of which have been incorporated in "00" gauge battery electric train sets also made on the premises for the Ever Ready Co. (Gt. Britain), Ltd. Manufacture is also just commencing on a new model electric speedboat, an initial production of 500 a day being planned.

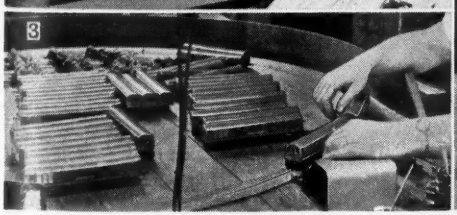
Since their manufacture started three years ago three quarters of a million miniature motor armatures approximately $\frac{5}{8}$in in diameter and $1\frac{1}{8}$in in length have been made. Several interesting devices have been adopted to supply and speed up construction. For example, the armature blocks, after being heated in a small oven, are given a coating of insulation by dipping in powdered polythene. This is followed by a coat of enamel which is stoved on.

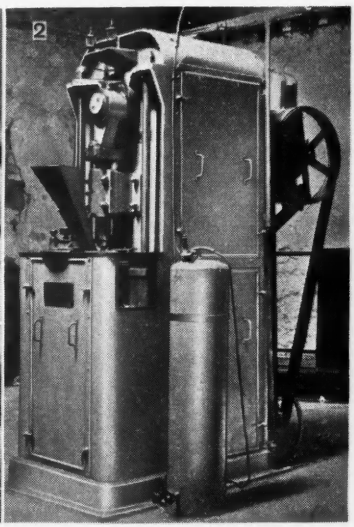
Placed on a mandrel, the blocks have the surplus polythene removed and any eccentricity rectified. The spindles are then inserted and semi-automatic winders apply 18yd of 36 s.w.g. enamelled wire to each of the three poles in six seconds. Each wire is tested to earth and the correct pairs are twisted together.

Transfer between these and subsequent operations is effected by means of a belt

(1) Semi-automatic winders employed in the manufacture of miniature motors. (2) Wheels for electric train sets are produced from a ferrous powder by this compacting press. (3) Testing electric train sets







conveyor running the full length of the assembly department. Continuing their progress the armatures have their three pairs of wires threaded through the commutators. Next the wires are cleaned, trimmed to length and prepared for soldering. All six wires are soldered in one operation by dipping into a ring-shaped bit on the soldering iron. Continuity and insulation are then checked and the units receive an application of a heavy glue preparatory to spending half an hour at a temperature of 160 deg C in a stoving oven. Manufacture is completed by the turning of the commutator.

Every motor is then thoroughly inspected. Surplus varnish is removed and the unit is gauged for diameter. The electrical circuits are then checked and there is a visual inspection for concentricity. Finally, the clearance between the shoulder and the spindle is checked. The units are then sent to one of the Ever Ready factories for fitting of the cases.

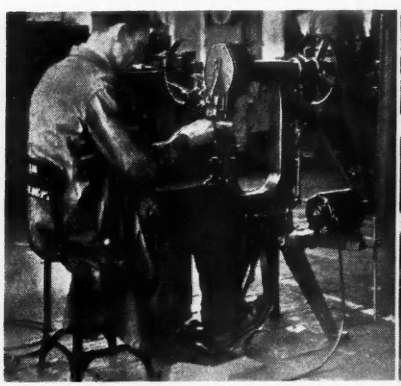
Returned to Dunadry, the motors receive a dynamometer test, utilizing one of the company's own motors as a comparator. The pinions are then attached. If the units are to be used in a train set they are inserted in the wheel assemblies and the pick-up carriers are attached, followed by the bodies. The wheels, incidentally, are produced from a ferrous powder by means of an electrically operated $8\frac{3}{4}$ ton compacting press.

A separate belt conveyor production line is used for making the control boxes which incorporate a resistance and forward and reverse contacts. After an extensive running test, the various units of the train sets are boxed and labelled ready for dispatch.

A machining operation on a component of a drawing office instrument

The manufacture of precision drawing instruments, compasses, dividers, etc., was the next industry we had a chance of seeing. At their factory, at Newtownards, Lee Guinness, Ltd., employ electricity for a variety of purposes in the production of components. In the first place extensive use is made of automatic machines, undertaking up to eight operations, for the less complicated parts. Other processes are carried out on a comprehensive array of machine tools, including capstan lathes, presses, drills, grinders and polishers. All

Left: **Testing the operation of an electrically driven wire stitching machine.** *Right:* **Polishing components of precision compasses**



the machines are individually electrically driven. Heat treatment of certain components is provided by Birlec electric furnaces.

Individual electric drive has also been adopted almost exclusively in another new industry, wire stitching machine manufacture, established at Newtownards towards the end of 1948 by British Brehmer, Ltd. This company produces several different types of wire and thread stitching as well as folding machines. All of these are normally designed for electrical operation and incorporate various electromagnetic safety devices. The manufacturing plant comprises machine tools, fully motorized, of various types (with magnetic chucks in many cases), dust extraction plant and a small muffle furnace. The machine tools are fed by conduit coming from overhead trunking.

We acknowledge the help of all the manufacturers whose factories we have referred to in this and earlier articles. Our thanks are also due to the Ministry of Commerce for arranging our itinerary.

Canadian Power

New Hydro-Electric Capacity in 1951 Totals 881,250 H.P.

THE Canadian Minister of Resources and Development, Mr. R. H. Winters, in his review of water power progress in 1951, states that the construction of new plant is keeping pace with the expansion of general industrial activity throughout Canada. In conformity with the usual pattern of power development, a large part of the new plant last year consisted of hydro-electric installations, though a number of thermal units of large capacity were also brought into operation. Several of the new developments are located in sparsely settled regions, with the power to be used in the immediate area.

New hydro-electric capacity brought into operation in 1951 aggregated 881,250 h.p., the province with the largest addition being Quebec. Allowing for the dismantling of several old plants, the total installed capacity in Canada is now listed at 13,340,774 h.p. This represents about 24 per cent of known resources. New plants and extensions to existing stations which are under construction for operation in 1952–53 exceed 1,700,000 h.p. and approximately the same amount is under preliminary construction or is definitely planned for operation in 1954–55. Supplemented by the output of new plants, production of electrical power was at a rate of approximately 13 per cent above 1950; in Canada as a whole, power production facilities were adequate to meet the current demand but little reserve capacity was available.

The principal developments in the various provinces are outlined below:—

BRITISH COLUMBIA.—A project of outstanding importance to the economy of British Columbia came under initial construction in 1951 when the Aluminum Company of Canada began preliminary work on the Nechako-Kitimat development. At the site of the underground power-house on the Kemano River the excavation of access tunnels has begun. Present plans call for an installation of 420,000 h.p. by early 1954 but tunnel and transmission line capacity are designed for a total installation of about 1,000,000 h.p. Beyond this, a second tunnel would be required to develop the maximum potential of the undertaking.

The first phase covers the construction of three 106,000 kVA units driven by 140,000 h.p. four-jet vertical impulse turbines and operating under a head of 2,590ft. The transmission line presents an extremely difficult engineering problem in the crossing of the 5,000ft high Kildala Mountain pass which is inaccessible for six months of the year. There is room for only two single-circuit tower lines in the pass and the 2·26in diameter a.c.s.r. conductors to be used will be, it is believed, the largest yet made.

The British Columbia Electric Co., Ltd., has under construction, for operation this year, a new development on Wahleach (Jones) Lake, about 15 miles east of Chilliwack; the plant will contain one 82,000 h.p. unit and will operate under 2,000ft head. Orders have been placed for 1953 delivery of equipment comprising a fourth 62,000 h.p. unit in the Bridge River plant.

The British Columbia Power Commission brought into operation two units at its Whatshan plant which will have an ultimate capacity of 66,000 h.p. At the John Hart development,

on the Campbell River, two additional units of 28,000 h.p. each will be installed for 1952–53 operation, bringing the total capacity to 168,000 h.p.

The Consolidated Mining and Smelting Co. of Canada, Ltd., commenced construction in 1951 of its Waneta plant on the Pend d'Oreille River, near its junction with the Columbia River. The power-house will contain two turbines each rated at 102,500 h.p. under a 210ft head; operation is scheduled for the spring of 1954.

QUEBEC.—During 1951 a total of 461,700 h.p. of new hydro-electric plant was brought into operation and about 1,500,000 h.p. is under construction for completion by 1955 and earlier. Several old plants have been dismantled. The largest single addition in Canada last year was that of 223,000 h.p. in four units in the Beauharnois No. 2 power-house of the Quebec Hydro-Electric Commission on the St. Lawrence River. The present installed capacity of the power-house is 333,000 h.p. and the ultimate capacity, to be reached probably in 1953, is 666,000 h.p. in twelve units under an 80ft head.

The Shawinigan Water and Power Co. added three 65,000 h.p. units to its La Trenche plant on the St. Maurice River. This plant now has a capacity of 325,000 h.p. which may ultimately be increased to 390,000 h.p.

The Aluminum Company of Canada has under construction two hydro-electric developments on the Peribonka River. The first, on which construction was started about a year ago, is at Chute-du-Diable and will consist of five units having a total turbine capacity of 275,000 h.p. with a head of 110ft. The second plant, on which work was begun last spring, is about 13 miles downstream at Chute-a-la-Savanne; it also is designed for five units of a total capacity of 275,000 h.p. under a head of 110ft. The first unit at Chute-du-Diable is expected to be in operation in May next and the first unit at Chute-a-la-Savanne in November.

The Manicouagan Power Co. has commenced the construction of a hydro-electric plant near the mouth of the Manicouagan River, designed for an ultimate capacity of six 50,000 h.p. units under a 125ft head, but the initial installation will be two units only. The plant will provide reserve power for the pulp and paper industry at Baie Comeau and will also supply electricity for secondary industries which are growing up on the North Shore of the River St. Lawrence.

ONTARIO.—Details of the large construction programme of the Hydro-Electric Power Commission of Ontario were given in our issue of 4th January. The eighth and final unit at the Des Joachims generating station went into service in February, 1951, making the total turbine capacity 496,000 h.p. The Chenaux station was also completed last year with eight units giving a total turbine capacity of 168,000 h.p.

Authority was obtained to increase the installation at the Otto Holden (formerly La Cave) station from six to eight units; all are to be completed before the end of this year and the total turbine capacity will be 272,000 h.p.

Plans are well advanced for the Sir Adam Beck-Niagara No. 2 station at Queenston which will contain seven units totalling 735,000 h.p.

The second 60,000 kW set at the J. Clark Keith steam station, Windsor, is expected to be ready next month and two others are to be added later. At the Richard L. Hearn steam station, Toronto, one 25 c/s 88,000 kW set and one 60 c/s 100,000 kW set have been placed in service. The second stage will raise the capacity to 376,000 kW (400,000 kW after conversion to 60 c/s).

MANITOBA.—Work proceeded at the Pine Falls development of the Manitoba Hydro-Electric Board on the lower Winnipeg River, and it is anticipated that the total capacity of 114,000 h.p. under 37ft head will be available this year.

The Winnipeg Electric Co. has under installation in its Seven Sisters plant on the Winnipeg River the sixth and final unit of 37,500 h.p. and operation is scheduled for 1952. This will bring the turbine capacity of the plant to 225,000 h.p. under a 66ft head.

The Manitoba Power Commission continued its rural electrification programme and service was provided to an additional 5,000 farms and to 19 towns and villages.

To supplement the peak capacity of its hydro-electric plants the City of Winnipeg has under construction an auxiliary steam station of which the first 15,000 kW unit is expected to be in operation soon and a second unit of 25,000 kW is planned to be ready in 1953.

ALBERTA.—The installed capacity of water-power plants was practically doubled during 1951 with the completion by Calgary Power, Ltd., of the Spray Lakes scheme which involves three new plants, and an addition to an older plant, in all 100,600 h.p.

The City of Medicine Hat has begun preliminary construction on a new power-house which will contain a 30,000 kW turbo-generator.

NEW BRUNSWICK.—The New Brunswick Electric Power Commission actively proceeded with the construction of its development of 27,000 h.p. in two units under 75ft head on the Tobique River and operation is scheduled for the spring of 1953.

NEWFOUNDLAND.—The Newfoundland Light and Power Co. completed its new 13,000 h.p. plant on the Mobile River. In Labrador, the Iron Ore Co. began preliminary construction of a development at Manihek Rapids on the Ashuanipi River, a tributary of the Hamilton River, designed for an initial installation of 12,000 h.p. in two units under 34ft head and of ultimately 24,000 h.p.

VIEWS on the NEWS

By REFLECTOR

By the death of King George VI the Electrical Industries Benevolent Association has lost its patron. Each year at the annual E.I.B.A. ball the Association received a telegram from His Majesty wishing it success. It is to be hoped that the new Queen may graciously consent to become the Association's patron and thus continue Royal recognition of a worthy cause.

* * *

Every basis adopted by Electricity Boards for calculating their tariffs seems to have its drawbacks. We have all heard of the scullery regarded as a room because it contains a cooker, even though no space is left for anything else. The floor-area system has also had its anomalies but one mentioned in *The Lady* is new to me. In "neighbourly conversation" one householder is reported as saying: "Why do they measure outside? My Queen Anne walls are three feet thick; the bungalow down the road is one brick thick." Such walls would certainly add an appreciable amount to the floor area, but aren't three-foot Queen Anne walls a trifle thicker than was customary? They sound Norman to me and there should be a special rate for castles.

* * *

Last week's *Electrical Review*, in describing the new Post Office television detector van, says that in addition to discovering unlicensed sets the "detectives" can assess the popularity of a given programme by counting the number of sets switched on. I doubt the validity of this proposition as it is too usual for sets to be running during practically all the transmission time. The B.B.C. would be flattering itself if it took this to mean that all its programmes were popular with all viewers.

* * *

When commenting recently on the removal by thieves of a section of buried telephone cable in Bushy Park I said that in spite of the high price of lead no thief had been bold enough to remove a power cable. Now a Rangoon reader tells me that about two years ago he lost a short length of "live" 6·6 kV cable which had become temporarily exposed through the subsidence of a nearby disused telephone manhole. Apparently the fault current, which must have been well in excess of 200 A to enable the protection to operate, did not unduly alarm the perpetrator as he remained and finished the job. The cable had presumably been cut with a hammer and chisel. As may be imagined, says my correspondent, the fault caused the location staff no little trouble.

* * *

Since receiving the letter from Rangoon I have seen a report of an incident nearer home. It recently occurred in Fulham where investigations after the failure of street lighting revealed that cable had been removed from three small inspection chambers. In each case a length of about two and a half feet had been sawn out. Bearing in mind that the theft must have taken place at night when the street lighting was on the thief must have taken a risk or, more probably, have known what he was doing.

* * *

The British Electricity Authority is frequently accused to-day (a strange accusation!) of selling its product too cheaply. But in the United States they seem to be even more reckless. Mr. Walter H. Sammis, president of the Ohio Edison Company, in an article in the November *Edison Electric Institute Bulletin*, says that in the United States the price per kWh decreased from 2·06 cents in 1940 for all classes of service to 1·81 cents in 1950, as compared with a cost of living increase of 71 per cent in the same period. Curves reproduced with the article show that while since 1940 the electric utility companies' operating expenses have risen by nearly 150 per cent their operating revenues have increased by less than 100 per cent.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Council of the Institution of Electrical Engineers has elected **Sir Arthur P. M. Fleming,** C.B.E., D.Eng., to honorary membership of the Institution for his distinguished work in electrical engineering, in particular in the field of technical education, his contributions to scientific research, and his services to the Institution. A similar honour has been conferred upon **Sir Edward Appleton,** K.C.B., G.B.E., M.A., D.Sc., LL.D., F.R.S., for his distinguished work in the field of pure and applied physics and his researches into the characteristics of the ionosphere and the part they play in determining the mode of propagation of radio waves. The thirtieth award of the Faraday Medal has been made to **Prof. E. O. Lawrence,** A.M., Ph.D., for his distinguished work in the field of nuclear physics.

Sir Arthur Fleming joined the British Westinghouse Co. (now the Metropolitan-Vickers Electrical Co.) in 1900. After a period with the Westinghouse Electric Co., Pittsburg, Sir Arthur returned to this country and was engaged on specialist engineering work, especially on transformer design and insulation technique. He was instrumental in founding the Research Department of Metropolitan-Vickers at Trafford Park, and was also a pioneer of broadcasting in this country, the transmitting station established at Trafford Park under his direction being the second in this country to send out regular daily programmes. He also helped in the work which led to the establishment of the Department of Scientific and Industrial Research. He has served on Committees of the I.E.E., B.E.A.M.A., and F.B.I., on the governing bodies of many universities and on several Government Committees. He is the holder of the Faraday and Hawkesley Medals, and is an honorary member of the Royal Netherlands Institution of Engineers. He has been very active in the affairs of the I.E.E. and was elected President in 1938. He is chairman of the Joint Committee on Practical Training in the Electrical Engineering Industry.

After service in the 1914-18 war, Sir Edward Appleton became assistant demonstrator in experimental physics at the Cavendish Laboratory, Cambridge. From 1924 to 1936 he was Wheatstone Professor of Physics at the University of London and during the three following years was Jacksonian Professor of Natural Philosophy at Cambridge. From 1939 to 1949 he was secretary of the Department of Scientific and Industrial Research; he is now Professor and Vice-Chancellor of the University of Edinburgh. His work in pure and applied physics received international recognition in 1947 by the award of the Nobel Prize for Physics. Other honours conferred on Sir Edward include the Hughes Medal of the Royal Society, the Ewing Medal of the Institution of Civil Engineers, and the Faraday Medal of the I.E.E.

Prof. Lawrence is Director of the Radiation Laboratory, University of California. His early researches were concerned with photo-electric effects. Later he conceived and built the first cyclotron which he used to study the transmutation of elements and artificial radio activity. For this work he was awarded the Nobel Prize for Physics in 1939. During the last war Prof. Lawrence was a member of the team of American and British scientists concerned with the development of fissile materials. By his "Calutron" mass separator method he succeeded in effecting the large scale separation of uranium isotopes, and this method was adopted in preference to the two other methods (the centrifuge and diffusion systems) which were under investigation at the same time. He has had many honorary degrees and other honours conferred upon him, including the Hughes Medal of

Sir Arthur Fleming

Sir Edward Appleton

Prof. E. O. Lawrence

the Royal Society and the Duddell Medal of the Physical Society.

Mr. E. J. Robertson, B.Sc.Tech., A.M.I.E.E., A.M.Inst.T., M.A.I.E.E., has relinquished his position in the Electrical Department of the Toronto Transportation Commission to take up an appointment with Bepco Canada, Ltd., Toronto office. Before going to Canada in February, 1949, Mr. Robertson was electrical engineer of the Manchester Corporation Transport Department. Bepco are acting as the Canadian agents for the contract recently placed by the Toronto Transportation Commission with the Gloucester Railway Carriage & Wagon Co., England, for the supply of 104 rapid transit cars for the first subway in Canada which is now being constructed under Yonge Street, Toronto.

Mr. E. J. Robertson

Mr. W. Brown has resigned his position as a director of the Metropolitan Electric Cable Co., Ltd. He founded the company and held the position of managing director from its inception until June last year. Mr. Brown has been particularly interested in the design and development of the type of cables used for colliery work, and has also developed special h.v. cables for rural electrification.

Mr. B. H. Dyson, who until recently was deputy general works manager, has been appointed general works manager for the four main factories of Hoover, Ltd. In addition to holding this responsibility for the whole organization, he is a director of Hoover (Washing Machines), Ltd. Mr. Dyson joined Hoover, Ltd., in 1937 and was appointed to a post in charge of time and motion study, later becoming production manager at the Perivale factory. During the war he was assistant works manager of the main factory at Perivale and five of the outworking factories. After the war he was made works manager of the Perivale group of factories and subsequently, at the beginning of 1951, deputy general works manager of the whole Hoover group. He is a fellow of the Institute of Industrial Administration and a member of the Council of the Institution of Production Engineers.

Mr. J. Ballentine has been appointed general and sales manager of the Bryterlite Electrical Co. (Belfast), Ltd., with effect from 4th February, **Mr. C. O. Innis** having left the company.

The **Telcon Social and Athletic Club** and the management of the Telegraph Construction & Maintenance Co., Ltd., took 630 children of employees by coach to Wembley on 2nd February to see the pantomime "Robinson Crusoe on Ice" as a change from the usual Christmas tea party. Fourteen coaches were required to convey the party.

Mr. W. H. Brent, B.Sc., M.I.E.E., Midland regional engineer, General Post Office, was one of five engineers and scientists who had honorary associateships of the Birmingham College of Technology conferred on them on 6th February. Another was **Mr. B. G. Robbins**, M.Sc., A.C.G.I., M.I.Mech.E., secretary of the Institution of Mechanical Engineers.

Pte. William Speakman, V.C., who was employed at the works of Edward Holme & Co. (1931), Ltd., before joining H.M. Forces, was invited to attend the Football Section's dinner-dance, held at the Unicorn Hotel on Friday, 1st February. This was attended by some 200 works staff and employees, and during the evening Pte. Speakman was presented with an inscribed silver cigarette case provided by subscriptions from the employees. The directors added a cheque for £50, and both were presented to him by Mr. R. H. Fawcett.

Mr. E. H. Skinner, M.I.E.E., the present manager of the Brighton and Hove District of the South Eastern Electricity Board, has been appointed the Board's deputy engineer-in-chief. He takes up his new duties on 1st April next and succeeds **Mr. W. E. Gibbs**, whose appointment as engineer-in-chief was announced recently. Mr. Skinner, who is fifty-two, is a Londoner by birth. He received his technical education at the Regent Street Polytechnic and joined the staff of the Stepney electricity undertaking. He subsequently served for many years at Colchester, where he ultimately held the position of deputy borough electrical engineer. In 1944 he was appointed city electrical engineer and manager of the Chichester undertaking. He held that post until vesting day, when he became district executive officer for Portsmouth and Fareham with the Southern Electricity Board. His service with "Seeboard" started in October, 1948, with the Central Sussex District and on the amalgamation, in November, 1949, of the former Brighton and Hove areas he became the first manager of the District.

Mr. E. H. Skinner

An interesting ceremony took place at the works of **Siemens Brothers & Co., Ltd.**, on 22nd January, when Mr. F. G. Goodall, the officer with the longest continuous service with the company's seagoing radio staff, was

presented with a certificate commemorating his thirty years' sea service. The company recently presented certificates of long service to employees with 50, 40 and 30 years' continuous service and in this instance the presentation was made by Mr. S. W. Lumb, the company's secretary.

Mr. R. Dean Roberts has recently taken up an appointment as director of personnel for the David Brown companies.

Sir Ernest Fisk has resigned from the managing directorship of Electric & Musical Industries, Ltd., as from 31st December last and also from all other directorships and offices held by him in the E.M.I. group. Originally a member of the Marconi Company, Sir Ernest was Marconi's principal assistant. In 1909 he joined a special mission to the Arctic and between 1913 and 1944, when he was appointed managing director of E.M.I., he was with Amalgamated Wireless (Australasia), Ltd., being chairman from 1932 to 1944. He received the first direct wireless message from England to Australia in 1918 and six years later made the first oral contact between these two countries when Marconi spoke to him from Cornwall. In 1940 he was appointed secretary of the Economic Cabinet in Australia and director of Economic Co-ordination. Sir Ernest is a past president of the Institution of Radio Engineers (Australia) and in 1944 was elected an honorary member of the Institution of Electrical Engineers. He was knighted in 1937.

Sir Ernest Fisk

Mr. W. G. Kefford informs us that he has resigned the position of London manager of W. T. Glover & Co., Ltd., to become a partner in Ferguson & Palmer, engineering contractors and agents.

Mr. F. G. Williams and **Mr. F. H. Crawshaw** have been elected to the board of the Z Electric Lamp & Supplies Co., Ltd.

Mr. J. C. N. Baillie, development engineer of the North of Scotland Hydro-Electric Board, has been elected a member of the American Society of Agricultural Engineers.

OBITUARY

Mr. T. A. M. Roberts, sales director of the Metals Division of Imperial Chemical Industries, Ltd., died suddenly on 3rd February at the age of fifty-one. Mr. Roberts' service with I.C.I. Metals Division dated back to 1916. He became metals sales manager in 1937 and was appointed to the division board in 1945. At the time of his death he was chairman of the Brass and Copper Tube Association and the Extruded Brass and Copper Alloys Association, and had held executive and advisory offices in the Cold Rolled Brass and Copper Association, the High Conductivity Copper Association and the Brass Wire Association. He was a prominent member of the executive committee of the British Non-Ferrous Metals Federation.

Mr. K. R. Mackley.—The death has occurred of Mr. K. R. Mackley, who for the past twenty-three years had been manager of the Liverpool Branch of Cryselco, Ltd. Mr. Mackley took an active part as a member in the work of the Illuminating Engineering Society and many other national and local organizations.

Mr. W. R. Caithness, joint managing director of the British General Electric Co. Pty., Ltd., since April, 1951, has died in Sydney at the age of sixty-seven.

Mr. G. Barnard.—The death is announced on 7th February at his Birmingham home of Mr. George Barnard, M.I.E.E. Mr. Barnard was born in 1862, and first became associated with the firm of W. O. Callender & Sons, the predecessors of Callender's Cable & Construction Co., Ltd., in 1880. He entered employment of the latter company in 1882 and after a short period of service in the works at Belvedere, he took part in the laying of vulcanized bitumen cables. He was soon appointed supervising contract engineer and was associated with the laying of cables from the Belvedere Road generating station, Lambeth, across the Strand to Covent Garden Opera House when this was first lighted with electricity on the Jablochkoff candle system; the cable for the first electric lighting system at Buckingham Palace; underground mains for the Adelaide Galleries generating station of the old Charing Cross Company to Maiden Lane; and some of the earliest cables in the City from Lombard Street to Queen Victoria Street. He also took charge of cable laying contracts at Antwerp, Le Mans and Bremen.

The late Mr. George Barnard

In 1890, Mr. Barnard was put in charge of the laying of the first cables for the Birmingham Electric Supply Co. and commenced his main life's work in Birmingham, where he remained actively engaged for over 50 years, as Callender's Midland engineer and manager. In 1932 he was appointed an advisory director

of C lender's and he retired at the age of seven -nine, on 31st December, 1941, after 60 y s' service.

WILLS

Mr. **T. F. Altham, M.I.E.E.**, managing direc r of Transformers and Welders, Ltd., Wat rd, and the inventor of the Hackbridge-Alth n protective system and a number of othe ransformer and cable developments, who died on 22nd July last, left £13,534 gross (£13 54 net).

Mr. **F. J. Ferrie**, late a director of Cam bell and Isherwood, Ltd., who died on 2nd May last, left estate "so far as can at pres t be ascertained" valued at £9,239 gross (£4,68 net).

Mr. **E. H. W. Cooke**, who had been comptroller of Associated Electrical Industries, Ltd., and was a director of a number of companies, left £23,580 gross (£22,888 net).

Mr. **G. N. S. Mackay**, assistant manager of Karachi branch of Standard Telephones and Cables, Ltd., who died on 2nd September in a car crash at Karachi, left estate in Great Britain valued at £2,400.

Mr. **C. M. Mills**, a director of the Chloride Electrical Storage Co., Ltd., and Pritchett & Gold & E.P.S. Co., Ltd., who died on 31st August last, left £42,428 gross (£39,126 net).

Mr. H. G. Brown, formerly managing director of the Westinghouse Brake & Signal Co., Ltd., who died on 20th August last, left £40,429 gross (£40,191 net).

NEWS FROM IRELAND

By Our Dublin Correspondent

THE possibility of using milled peat in Co. Mayo for the generation of electricity is discussed in the *Irish Independent*. Tentative investigations have been in progress several months. The Electricity Supply Board is reported to have experimented with one "harvesting" field for the production of milled peat. The crop was transported to Lullymore, where the milling system has been in operation for years, and was found to be "highly satisfactory." The present turf-fired stations are designed for the more familiar sod peat.

Reference to the investigations was made recently by the Minister for Industry, Mr. Lemass. He said that the technical problems in the production of milled peat had been solved and the process was now almost entirely mechanized. This was in a large measure the achievement of Bord na Mona engineers. It was now intended to use it as a fuel for electricity generating stations for which it had many advantages over ordinary peat. Two areas considered suitable for development lay between Crossmolina and Bellacorick and between Bangor-Erris and Ballycroy. The Crossmolina–Bellacorick area would be dealt with first in conjunction with the E.S.B. plan to construct a power station there. The success of this Mayo experiment might be of great significance for the whole future use of Irish peat resources for power purposes. It now seemed probable that all future power projects based on turf would be designed to use peat in the milled form. The necessary legislation to sanction the expenditure of the additional capital required was in preparation and would soon be submitted to the Dail.

On 29th January the 55,000th building—the Parish Hall at Kilsaran, Co. Louth—was connected under the rural electrification scheme begun five years ago by the E.S.B. Mr. R. F. Browne, chairman of the Board, and other officials were present at the switching-on by Very Rev. Owen McEvoy, Castlebellingham. Mr. Browne said that about a quarter of the total work contemplated had been completed. The chief difficulty encountered when the scheme started was obtaining supplies of essential materials. Substitute but absolutely safe materials had had to be used in many cases.

SOUTH AFRICAN TRADE

DURING the nine months ended September last electrical imports into the Union of South Africa increased in value by more than a third compared with the corresponding period of the previous year. The variation in the principal groups is shown in the accompanying table. It will be seen that the only decrease was in transformers.

The Union Government has not yet resumed publication of detailed statistics showing distribution of trade. Summarized figures give the United Kingdom's share of Union imports as a whole as nearly three-quarters. The Union is Great Britain's second best customer for electrical material.

Class of Goods	January to September	
	1950 £ (000)	1951 £ (000)
Batteries and parts	334	523
Dynamos and generators ..	705	862
Electric motors	1,059	1,479
Transformers	1,164	977
Cable and wire (rubber insulated)	275	427
Cable and wire (other)	584	800
Electric stoves and parts ..	106	262
Electric lamp bulbs	287	367
Radio apparatus and accessories	546	1,183

Exports of electric cable and wire during the nine months were valued at £926,000 against £534,000 in January–September, 1950 and of machinery and parts (unspecified) £3,715,000, compared with £2,559,000.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Buried Cables

IN his article on this subject in your issue of 8th February Mr. Sugden has given a very clear account of the case in which it was decided by the Court of Appeal that, where a cable was wrongfully laid across land, there was no trespass against the cable when it was damaged by an excavator rightfully on that land. I am not, however, entirely in agreement with his summary of a contractor's position in such circumstances.

There is a rule of law that the employer of an independent contractor is not responsible for any wrongs done by the contractor in the course of the work or in its result; but, as with all rules, there are many exceptions. To take Mr. Sugden's example, the contractor laying a cable across a piece of land to the orders of his employer (who has presumably specified the route), would be liable in negligence only if he was negligent either in the way he performed the laying or in the state in which the cable was left after completion. Suppose the employer had no right to bury a cable in that land, then he, the employer, would be guilty of trespass; and if the contractor were joined as defendant in an action for trespass against the employer, or even if he were sued instead of the employer, he could, if damages were awarded against him, recover contribution (i.e., indemnity) from the employer.

Broadly speaking, the test is whether the employer himself is under a duty which has not been performed; if he is, then he cannot escape liability by saying he had instructed someone else to do it for him (though in certain cases he can). In our example his breach of duty has been in trespassing on another's land, and it is not the contractor's duty to ascertain the position in regard to the land; though if the contractor knew it was a trespass, he could be liable.

On the other hand if, in laying the cable, the contractor finds, say, another cable already there and damages it then he, and not the employer, is liable. Again, suppose the contractor is laying a cable on the employer's own land and, in following a route selected by the employer, excavates so close to a building on the adjoining land that the foundations are endangered; the employer is clearly liable to the adjoining occupier, as it was his duty, and not that of the contractor, to guard against the danger.

The whole question is, unfortunately, fraught with difficulty, as are most legal problems concerned with the common law and not with statute. So much must inevitably depend upon the actual, and often detailed, facts of each case. But I doubt whether Mr. Sugden's final suggestion of an indemnity clause in a contract would be of much avail; there are too many ways in which an employer could avoid such a clause.

BARRISTER-AT-LAW.

Power Station Construction

MR. H. E. MANNING has stated in his letter (1st February) that whereas at Acton "B" the weight of steel for precast reinforced concrete construction was 0·16 ton/sq yd of area covered, the corresponding figure for Skelton Grange with *in situ* construction was 0·09 ton/sq yd.

Mr. Manning has arrived at the figure of 0·16 through a misapprehension of the figures that were given in the article in your issue of 18th January. The 330 tons of reinforcing steel was that required in the framework of the turbine house and switch house annexe which replaced approximately 1,000 tons of structural steel. For the turbine house itself, including the reinforcement in the roof slab, the weight of reinforcement was 220 tons, giving a weight of steel per sq yd of approximately 0·10 ton, which is only slightly higher than the figure for Skelton Grange. The extra weight required at Acton is accounted for by the fact that the columns along one side of the turbine house had to carry the structural steel columns of the boiler house at roof level, and the roof slab of the turbine house was specified to have a minimum thickness of 5in.

I do not claim that the precast form of construction is necessarily more economical in the use of reinforcement than the *in situ* construction. Each case has to be considered on its merits; at Acton the precast form of construction allowed very speedy erection, greatly reduced the amount of scaffolding required and made the shuttering problem much easier.

London, W.1. H. F. ROSEVEAR, M.I.STRUCT.E., Sir Robert McAlpine & Sons, Ltd.

Load Spreading in Scotland

A PARAGRAPH on page 208 of your 1st February issue contains a reference to the cessation of load spreading in Scotland subject to weekly review. On behalf of the Scottish Board for Industry, in whose hands lies the responsibility for making the arrangements, I would like to point out that the position is that as from 4th February industry and commerce were asked for a 10 per cent cut in place of 20 per cent that had been in operation since the beginning of the winter. In achieving this 10 per cent cut it would not be necessary for firms to submit schemes for the Board's approval.

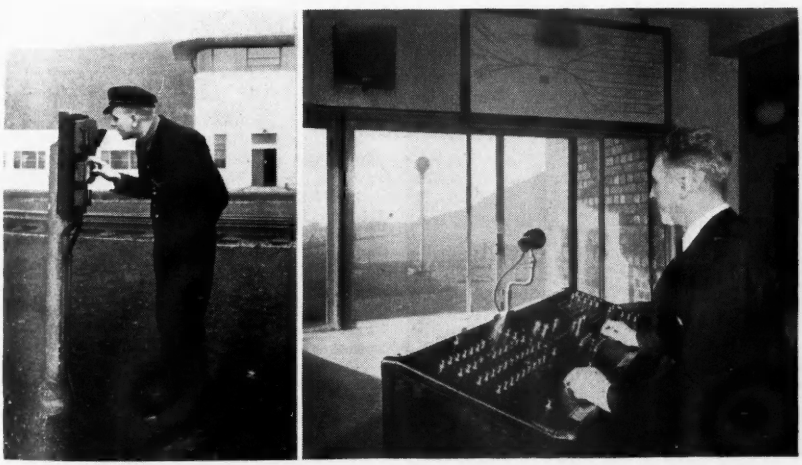
This reduction was consequent upon an earlier agreement made by the Board that the position should be kept under review, and that if any improvement should take place the benefit would be passed on at the earliest possible date.

Glasgow. B. H. GIBSONE, Press Officer, Scottish Information Office.

Railway Communications System

Control of Marshalling Operations

ONE of the largest railway marshalling yards in this country, the "up" yard at Toton, Notts, has recently been reorganized and mechanized. Included in the new equipment is an extensive system of loudspeaker communication designed and manufactured by the General Electric Co., Ltd. The yard extends over 1¼ miles and can deal with 3,000 to 4,000 wagons in 24 hours. Wagons are shunted over a hump and allowed to run downhill to 37 sidings, but the setting of the points and the braking of the wagons is done remotely from control buildings overlooking the yard. It has been found that the microphone and loudspeaker provide a most effective method of issuing instructions throughout the yard, assisting the quick



An outdoor microphone in use and *(right)* microphone and loudspeaker in the hump control room

passage of wagons, since instructions can be received without the recipients leaving their posts to answer a telephone.

The sound equipment consists of 25 microphone control positions, 15 amplifiers of various power outputs up to 60 W, and 40 loudspeakers, mostly outdoors. The grouping of the circuits is such that 13 two-way communications can be carried on between various points.

The loudspeaker network is so arranged that the hump control room has two-way communication with the signal-boxes, the ground staff dealing with incoming trains and the main control tower. The control tower is also able to communicate with staff in the area around the remotely controlled wagon brakes and the inspectors and foremen responsible for the two separate exits at the southern end of the yard, where the newly sorted wagons depart after being made into fresh trains. Each of the inspectors has two-way communication to the signal-box concerned and also to the ground staff in order to facilitate the departure of those trains.

Cleaning Telephone Wires

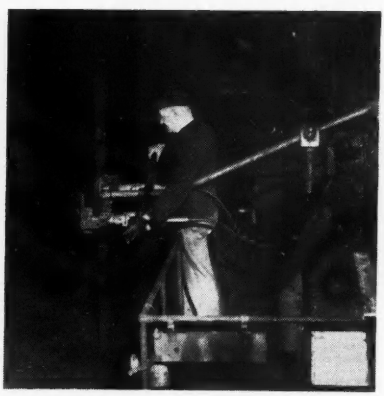
LONDON TRANSPORT'S signal engineers have devised a new method of cleaning the two telephone wires which run alongside every underground track and provide the means by which train crews can cut off traction current in an emergency as well as communicate with substation or traffic controller.

The cleaning of these wires has hitherto been carried out by hand, mainly with emery cloth; the new method involves the use of power-driven brushes. Two wire brushes, of 6in or 8in diameter, mounted on parallel shafts about a foot apart and operated by separate electric motors, form a unit which is free to pivot in a vertical plane about the end of a long rod. This rod is connected through a universal joint to an arm which pivots horizontally about a vertical column mounted in the centre of a ballast wagon, suitably modified. Two wagons have been equipped in this way, so that the two wires can be dealt with simultaneously, and form a short train with a battery locomotive which also supplies power for the motors.

The train carries a crew of six—driver, supervisor, one man to remove the protective grease from the wires, two to operate the brushes and a fourth to regrease the wires after cleaning. To reduce fatigue in the brush operators the weight of the electric motors is counterbalanced. At present the use of the apparatus is restricted since it is not able to deal with the low position of the telephone wires on some lines. In view of the results so far achieved, however, it is hoped to adapt a flat wagon which, with its low floor, will permit the apparatus to be so mounted that it can be raised or lowered to suit the height of the wires to be cleaned.

Advantages of the new method include a considerable reduction in man-hours per mile of wire cleaned as well as improved cleaning efficacy.

Cleaning Underground Railway telephone wires by power-driven brushes



E.A.W. Examinations

THERE are now forty-one more demonstrators and saleswomen holding the E.A.W. Certificate in Electrical Housecraft, bringing the total to 1,740. The recent successes were gained at the 30th examination held at eighteen centres throughout the country and included one at Colombo, Ceylon, where the entrant was one of three candidates gaining distinction.

Fifty-five candidates were successful out of an entry of fifty-nine at the 27th Certificate Examination for Teachers held at eight centres. Five distinctions were gained and the total number of certificate holders is 1,701.

At the second E.A.W. Examination for Electrical Sales Assistants thirty-three candidates were successful, among them two men, one of whom was among the seven candidates gaining distinction. There are now seventy-five holders of this certificate which was established in 1950.

Are Tramways Obsolete?

Decisions which Refute the Suggestion

In a recent article on this subject in the Indian paper *Lifelink*, Mr. Bijoy Ratna Mazumdar refers to the announcement by the Calcutta Tramways Co. that it is increasing its fleet of rolling stock by thirty new streamlined tramcars with a further fifty to follow in the near future.

This leads to a consideration of the wisdom or otherwise of abandoning the tramway system as most towns in Great Britain have done. It is mentioned that of the original 180 systems only nineteen remain and many of these are being abandoned in favour of motor vehicles.

The advantages of the tramcar in heavily populated towns are stressed but it is admitted that in narrow winding streets and hilly districts a preference for motor vehicles is justified. Developments in other countries suggest that those towns now running tramway systems should consider whether a change would be for the best.

Scandinavian Developments

The most notable tramway progress has taken place in Europe, where almost every country has had new trams since 1945. In Sweden, Stockholm has placed in service a fleet of 100 single-ended bogie cars each with a total capacity for 104 passengers, and the towns of Gothenburg, Malmö, Hälsingborg and Norrkoping have taken delivery of batches of similar but smaller cars. These new Swedish trams are of advanced modern design, embodying the latest electrical and mechanical developments. The Oslo system, which includes some lengthy inter-urban lines, has recently ordered 50 trams of an improved design and is to build subways across the city centre. Copenhagen has a post-war experimental car in service which incorporates many of the latest features of European tramcar practice, is designed for "pay-as-you-pass" and has a total capacity of 93. On the other side of the Baltic, in Riga, a three-section streamlined car with a total capacity of 200 has been evolved.

Tramway development goes ahead in the U.S.S.R. and post-war cars built for Moscow and other cities closely resemble the American "P.C.C." car in appearance and design. Many Russian tramways have been completely rebuilt.

Germany faced the same task which has been tackled with great energy. There has been a steady flow of deliveries of utility cars, some of these being bodies only, to fit trucks salvaged from cars destroyed during the war. Hamburg has produced a fine modern car of typical German design, incorporating many of the latest features of modern tramcar construction, planned for "passenger flow" and capable of carrying 197 passengers (with trailer). Several German cities have built route extensions since the war, a particularly fine example being the reserved-track Messengelande line opened in Hanover in May last year.

Modernization in Holland

In Holland, new cars now run in Rotterdam, Amsterdam and The Hague; the last-named city is now operating two American type P.C.C. cars assembled in Belgium and has ordered more of these cars from the Wagenfabriek La Brugeoise. Belgium was the first European country to acquire a P.C.C. car of American design. Further P.C.C. cars are under construction in Belgium by La Brugeoise for the Vicinal and these will have the characteristic American body design. The S.N.C.V. has also placed in service several new types of bogie and single truck trams of modern Belgian design, restored many of its damaged lines, electrified steam tramways and built new lines. Brussels has ordered P.C.C. cars with a modified body design from La Brugeoise. The Brussels tramways have also built new extensions, indulged in a large scale rebuilding programme to convert the trams to "passenger flow" and made extensive track rearrangements in the city centre. A tramway subway is under construction in connection with the building of the new Midi railway station.

In North America there are still 80 systems working tramcars and recently

nearly 5,000 cars of ultra-modern design have been supplied in the United States and Canada. Chicago heads the list with 400 cars, followed by Toronto (250), Philadelphia (110), Detroit (106), Pittsburgh (100) and Minneapolis-St. Paul (100). Toronto has one of the finest tramway systems in the world. The vehicles run on public streets and they will shortly run on an underground line. Extensions also include rapid transit tramway routes all to radiate from a mile long tramway subway.

None of the major South American cities has abandoned its tramway system and Buenos Aires has 300 new cars on order. The Montevideo tramways have been thoroughly rehabilitated since they were taken over by the municipality in 1947.

The most progressive tramway systems in Australia are those of Brisbane, Melbourne and Adelaide. Melbourne has just completed the conversion of a bus route to street tramway and work has now begun on another extension which, at the moment, is served by motor bus.

It will thus be seen that the trend in Great Britain towards abandoning street tramcars is not common in other important parts of the world and in cities as highly industrialized as those of Great Britain. In Calcutta 370 cars are in daily service and run a total mileage of 36,000 and carry about a million paying passengers per day.

From these considerations the author says it is clear that electric tramway systems are by no means out of date or likely to become obsolete but are very much alive and up-to-date. This is particularly so when transportation problems in large cities are being considered and where a big volume of traffic has to be carried. In such circumstances electric tramway systems are likely to expand and to extend their activities.

Aircraft Radio Remote Control

IN addition to the manually operated remote control units for use in conjunction with the Plessey transmitter/receiver, type P.TR.61 C and D, a system of electrical remote control has now been developed. This facilitates installation of the equipment in an aircraft without restriction as to position or distance from the control box, and permits the use of more than one control point with no additional installation complications.

Plessey v.h.f. transmitter/receiver with remote control adaptor and (inset) the operator's control box

The transmitter/receiver provides v.h.f. radio telephone communication facilities on any one of six crystal controlled channels within the aeronautical band 116–132 Mc/s and this remote control system provides, by the operation of a single control, for the selection of any one of these crystals, the entire procedure of tuning and crystal selection being carried out automatically. No restriction is imposed on the frequencies used, or on the order in which they appear. Each of the six pre-set frequencies may be positioned at any point within the coverage of the transmitter/receiver.

Provision is made for immediate access to the pre-set adjustments of the tuning control: use of the tuning meter, connected to the monitor socket provided on the front of the equipment, allows any of the channels to be readjusted without removal of the equipment from the aircraft. An additional advantage is that normal operation requires the use of only one control when changing channels.

The total weight of the remote control equipment, with one control box to S.B.A.C. standard dimensions, is about 2·75 lb. and current consumption is given as 3·5 A. An alternative type of controller is available for aircraft not fitted with S.B.A.C. racking.

Electrical Research

E.R.A. Annual Meeting and Report

THE thirty-first annual general meeting of the British Electrical and Allied Industries Research Association took place for the transaction of formal business, on Friday morning of last week at the Connaught Rooms, London, W.C. At the opening all present stood in silence as a mark of respect to the late King.

Mr. H. Astbury, who represents the B.E.A.M.A. and was due to retire by rotation, consented to continue as chairman of the Council for a second year and was re-elected.

The annual report and statement of accounts for the year ended September last were adopted without discussion. When formally presenting them the chairman remarked particularly upon the income received in 1951, but not likely to recur again in such amount, from the associated E.R.A. Patents, Ltd., as the result of painstaking endeavour by the staff over several years in cases in which patent rights were clearly established.

Mr. E. Long, B.E.A., was elected to the Council while the following, due to retire by rotation, were re-elected: Mr. F. H. Bramwell, representing ordinary and associate members; Messrs. B. G. Churcher and T. M. H. Stubbs, B.E.A.M.A.; Sir John Hacking and Lt.-Col. E. H. E. Woodward, B.E.A.; Messrs. H. H. Mullens and H. Nimmo, Electricity Boards; and Mr. F. C. Winfield, North of Scotland Hydro-Electric Board. Sir George Nelson, who is president, succeeded Lord Citrine who had served in that capacity for two years.

ANNUAL REPORT

The annual report is a comprehensive record of activities during the year 1950–51, but in less detail than formerly. The account it contains of researches has been reduced by half to avoid its length prejudicing members against reading it. One introductory page outlines the two appeals (which are referred to in the leading article of this issue) made to members to increase the revenue and to contribute to the laboratory building fund. Long-term researches have all been continued and the number of short-term investigations proposed by members has increased substantially.

The Mechanical Engineering Research Organization is helping to provide adequate creep-testing facilities for the expanded E.R.A. programme on high temperature alloys, which is urgent on account of the steam turbines now being constructed to operate at higher temperatures. The equipment at the Imperial College for extending the steam tables to higher temperatures and pressures is nearly ready.

The provision of low-loss magnetic sheet steel remains a serious problem for the electrical industry. A major development during the year in this connection was the conclusion of an agreement with the British Iron and Steel Research Association to proceed with a substantial programme of fundamental research, jointly sponsored by the E.R.A. and with the hope of securing the co-operation of relevant steelmaking interests.

Insulation Studies

A large proportion of the Association's resources continued to be applied to electrical insulation studies, in which connection the Ministry of Supply asked for an increased effort. This work, as in former years, is distributed between the universities, the National Physical Laboratory, member firms and the E.R.A. laboratory, but it has been hampered everywhere by shortage of staff. A number of ways in which breakdown can be caused by internal discharges have been demonstrated, to some extent quantitatively, while a recently obtained, though rather negative, result in the case of corona breakdown disproves a simple hypothesis yet points the way to a better understanding of the issues involved.

There has been further extension of the theory of electrons in solid dielectrics, but indirect evidence that has aroused more

interest is Prof. H. Fröhlich's theory of supra-conductivity, based upon concepts developed for the E.R.A., which fits the experimental facts better than any hitherto proposed. A start has been made with the fundamental study of the electric strength of liquids.

The work on flameproof motors, including pressure piling in running motors, flange gaps and intrinsic safety has been reorganized and will now be conducted by E.R.A. staff under the supervision of senior officers of the Ministry of Fuel and Power at the Safety in Mines Research Establishment, Buxton.

Support from that Ministry has enabled costing studies to start for determining whether the cost of generators can be made low enough for wind power purposes. Although important results had been obtained with the E.R.A. model d.c. transmission system, a full-scale trial scheme for d.c. transmission at high voltage has been planned and placed before the Council.

Earthing Code

The recommended Code of Practice on Earthing had been nearly completed, but the continuity of conduit systems, including light-alloy components, earthing to water mains and to pipes demanded further investigation. Interest in the economics of this subject has been such as to cause the study to be extended to fire risks.

Among agricultural investigations the first stage of an electric mains-driven tractor has been successful. Preliminary consideration has been given to the use of the heat pump for milk cooling and dairy water heating, and heat sources have been studied, in particular domestic heat pumps of which prototypes may soon be tested.

An investigation is proceeding into the performance of floor heating installations, which afford some degree of thermal storage, but the general problem requires consideration of a number of thermo-chemical methods. Records have been obtained in differently constructed buildings of various types of installation, depths of heating cables and range of ambient temperatures. Determination of the optimum conditions for electrically drying and airing clothing and domestic textiles economically is to begin.

An improved "Argonarc" process of welding aluminium has been patented (provisionally protected last year) with special reference to apparatus for arc maintenance at low open-circuit voltage without the radio interference normally associated with high-frequency spark injection equipment. Experimental plant of this kind is now being constructed by some member firms. More staff is needed to avoid hampering welding investigations. The British Welding Research Association continues its financial support.

The potential importance of the fuel cell (hydrogen-oxygen) is so great that a determination of the practical feasibility of the type which has so far given the most promising results has been deemed essential. A programme of work on a larger scale than that already done some years ago is accordingly being proceeded with under the supervision of Prof. T. R. C. Fox, Department of Chemical Engineering, Cambridge. As some £4,000 yearly is required to ensure reasonably rapid investigations, the Ministry of Fuel and Power has agreed to reimburse the E.R.A. any costs up to a limit of £2,500 for one year that may be incurred in excess of the £1,500 hitherto found yearly by the E.R.A.

Technical Liaison

The system of technical liaison by means of visits to the works of member firms, instituted last year, has been welcomed. It is being extended and reorganized under a technical liaison officer with a small personal staff, but the E.R.A. technical secretariat will continue to make most of the visits in order to ensure co-operation with the committee organization of the Association. In this way member firms will widen their knowledge of what is being done by the E.R.A., while the latter will better appreciate the immediate needs of manufacturers.

This liaison must not be confused with the technical information and library services rendered by the E.R.A., which are very successful. Loans of journals, for instance, arising from the weekly abstract service have risen to 4,000 in a year. There have been so many requests for translations that the strengthening of the translation staff is under consideration. The E.R.A. staff numbers 287 and 100 new reports were issued to members during the year under review.

The annual luncheon usually held on the same day as the meeting has been postponed until 22nd February.

Conditions in Italy

Scope of Electrical Industry

INDUSTRIAL production in Italy is handicapped by a natural deficiency of liquid and solid fuels and of most raw materials. Against this the country has reserves of skilled labour, a tradition of craftsmanship and large natural water resources for the development of electric power.

In his report on the economic and commercial conditions in Italy* Mr. E. R. Lingeman, C.B.E., H.M. Minister (Commercial) at Rome, stresses the importance of the Italian electrical engineering industry in the general economy of the country. He states that the industry has a wide range of manufactures and although it cannot meet domestic requirements in every section, it provides a valuable export trade, estimated by Confindustria (Confederation of Industry) to reach a value of 10,000 million lire yearly (1,750 lire = £1). There are about 500 firms, employing 100,000 people, with an output estimated at 100,000 million lire. It is in the process of being re-equipped and modernized, with E.R.P. aid. Like many Italian industries, it is composed of a large number of small units and a few big concerns. Full statistics of production are not readily available, but the report gives the following table taken from Confindustria's report for 1948, which indicates the scope of the industry's activity.

Product	No. of firms	No. of employees	Annual Output
Heavy generators Heavy transformers	10	6,500	1,000 MW 1,100 MVA
Mercury vapour rectifiers			150 MW
Small and medium generators Small and medium transformers	80	12,000	1,100 MW 1,300 MVA
Electric railway, tramway, etc., equipment and rolling stock	10	5,500	—
Switch and control gear	70	8,000	10,200 metric tons
Electric furnaces Soldering equipment	30	2,000	110 MW 60 MVA
Domestic electrical equipment (largest concerns only) ..	50	4,000	600 MW
Electrical apparatus for vehicles ..	30	5,500	—
Light bulbs ..	25	4,500	60 million units
Thermionic valves (excluding radio)	5		4 million units
Telephone and telegraph apparatus	50	6,000	—
Insulated cables, wires and conductors	25	8,000	55,000 metric tons
Cinematograph equipment ..	15	2,000	850 units (35 mm) 1,700 units (16 mm)
Electro-medical equipment ..	15	1,500	—
Measuring instruments	25	3,000	31,500 transformers 500,000 meters 190,000 various types
Radio equipment ..	70	10,000	350,000 domestic receivers 1,000 professional sets
Electrical carbon products (mostly for metallurgical industry) ..	8	1,000	5,200 metric tons

The report contains little detailed information on the exports of electrical equipment and apparatus from Italy. The principal foreign markets are South American countries (particularly Argentina, Brazil and Uruguay), Switzerland and other countries in Northern and Eastern Europe. Exports of the following items alone had a value of approximately 8,200 million lire in 1948 and 9,700 million lire in 1949:—

Item	Metric tons		
	1938	1948	1949
Electric generators and motors	1,904	3,545	2,972
Stationary transformers ..	224	590	1,748
Miscellaneous electrical equipment (Tariff No. 457) ..	1,112	2,466	3,352

Although the general trend of trade with various countries is indicated by Mr. Lingeman, and lists of principal imports are given, the imports of electrical equipment and apparatus are not specifically mentioned. In dealing with trade with sterling countries, however, Mr. Lingeman states that machinery and apparatus, and iron and steel products were large items of import from the United Kingdom. Partly

*Published for the Board of Trade Commercial Relations and Exports Department, by H.M. Stationery Office, 5s net.

owing to her balance of payments position and partly as a result of the present under-employment of her own industrial capacity, Italy's imports of some consumer goods are limited, and are likely to be for some time. Italy's main expenditure in the sterling area is still directed towards purchases of such items as industrial raw materials and capital equipment. Even in the case of industrial machinery, technical apparatus, etc., the Italian authorities are often reluctant to issue import permits in order to give the maximum protection to domestic industry. For these reasons, and because of the existence of large manufacturing industries in Italy, the market possibilities for British manufactures taken as a whole are modest. Nevertheless opportunities for British manufactures exist in such fields as capital equipment for industries, scientific and medical equipment and instruments. The fact that the Italian Government has offered to importers lire credits for the acquisition in the United Kingdom of machinery, industrial plant and equipment of types that cannot be acquired in Italy, thus making use of up to £50 million of her sterling balances, shows that interest in these types of British exports already exists.

Electric Power Development

In 1938 the total electrical energy produced in Italy amounted to 15,500 million kWh (14,580 million hydro-electric and 960 million thermo-electric). Owing to the ravages of war, production fell to 12,600 million kWh in 1945, but by 1947 production had recovered to 20,600 million kWh (91·7 per cent of which was hydro-electric) and in 1948 a figure of 22,700 million kWh was achieved. Shortage of water in 1949 resulted in a reduction in output, but there was a steady improvement in 1950 and it was possible to lift all restrictions on industrial use. In spite of this increase, however, the supply of electric power is at present barely able to keep pace with the growing demand caused by increases in population, improvement in industrial technique, railway electrification, mechanization, etc., and new installations are urgently required.

A programme of expansion of hydro-electric plant giving an additional annual production of some 8,000 million kWh was submitted by the Italian Government to O.E.E.C. as part of its long-term programme. As regards thermo-electric stations, an increased capacity of about 1,500 million kWh is anticipated. The total output envisaged for 1952–53 is 32,800 million kWh, of which 30,850 million kWh (94 per cent) will be from hydro-electric sources.

Date	Hydro-electric		Thermo-electric
	Effective potential (MW)	Average annual capacity (million kWh)	Effective potential (MW)
Dec., 1938	4,081·8	17,300	992·8
Dec., 1948	5,531·8	21,927	1,029·0
Dec., 1949	5,957·7	23,334	1,063·9
Oct., 1950	6,131·9	23,670	1,141·0

Figures provided by the Confindustria showing the increased capacity of hydro-electric and thermo-electric plant are given in the above table.

STREET LIGHTING PLANS

IN a letter from the Ministry of Transport's divisional road engineer, deferment of the major portion of the HUDDERSFIELD Town Council's street lighting plan was suggested. The Highways Committee accordingly put forward a curtailed scheme, but at a subsequent meeting of the Town Council an amendment was carried that "owing to the large and constantly increasing volume of fast-moving traffic on our streets . . . the Council adheres to its already agreed schemes for capital expenditure on street lighting works for the next financial year."

BRADFORD Corporation has approved schemes submitted by the street lighting superintendent for the provision of electric street lighting on the following housing estates:—Thorpe Edge estate (£8,922), Shirley Manor estate (£2,046) and Elmfield estate (£1,675). The lighting of Halifax Road is also to be improved. (£2,514.)

WALSALL Corporation Public Works Committee recommends approval to a scheme for the installation of mercury-vapour lighting along Wednesbury Road to the borough boundary via Corporation Street, West Bromwich Street (part), Weston Street, and West Bromwich Road, at an estimated cost of £4,900.

LUTON Corporation Highways and Planning Committee has approved modified proposals submitted by the borough engineer for the conversion to sodium lighting of the street lighting in Cromwell Road and Biscot Road, at a cost of £3,050, and in Mayne Avenue, Leagrave High Street and Grange Avenue, at an estimated cost of £1,760.

WASHINGTON (Co. Durham) U.D.C. surveyor is preparing a scheme for improving the street lighting.

Commerce and Industry

Further Productivity Teams

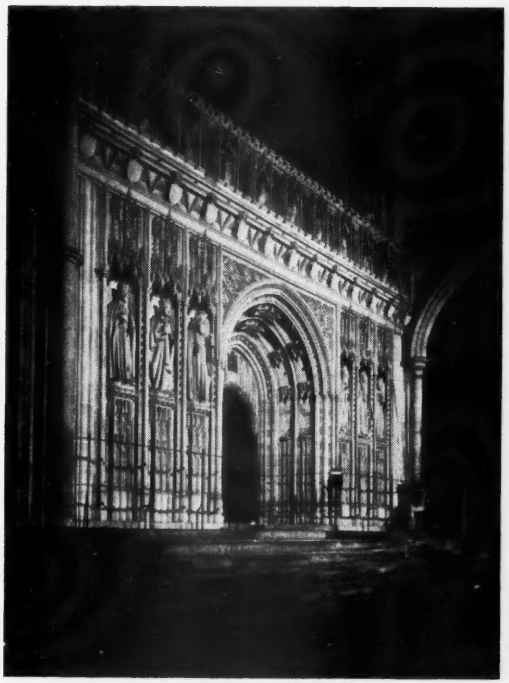
Process Heating Installation

THIS week two Productivity Teams—Plastic Moulding, and Design for Production—sailed from Southampton in the *Queen Elizabeth* for a tour of America under the auspices of the Anglo-American Productivity Council. The Plastics Team is led by Mr. A. L. Sparshott, head of development of the Witton moulded insulation works of the General Electric Co., Ltd., and the members include Mr. L. F. Honey (foreman) and Mr. E. Patching (plastic moulder) of Hoover, Ltd., and Mr. J. R. Tegerdine (polisher) of E. K. Cole, Ltd. Mr. C. J. G. Stanley, manager of the British Plastics Federation, is the team secretary.

The Design for Production Team is headed by Mr. R. S. Medlock, research and development engineer, George Kent, Ltd., and Mr. M. H. Thomas, chief industrial officer, Council of Industrial Design, as joint leaders and the members include Mr. F. E. Butcher, group design manager, Joseph Lucas (Electrical), Ltd., Mr. G. W. Hart, general manager, Electronics Division, Murphy Radio, Ltd., Mr. R. A. H. Scanes, quality supervisor, Evershed & Vignoles, Ltd., Mr. H. Smith, draughtsman in charge of development and research, and Mr. G. A. J. Witton, works manager, J. Stone & Co., Ltd.

Cathedral Lighting

Illustrating the work which they have undertaken, Drake & Gorham (Contractors), Ltd., have produced a booklet comprising a series of photographs of the interior lighting at Canterbury Cathedral. These show strikingly how the beauty of the fabric is revealed by tasteful illumination. The photograph we reproduce is of the rood screen; for the lighting of this two specially designed bronze floodlight fittings each containing three 200 W lamps are mounted at high level on columns in front of the screen. Among the other views in the booklet are two of the Chapter House roof, the elaborate vaulting of which is brought out by indirect lighting. The twenty 500 W fittings are mounted 15ft above floor level behind the heating panels, the switching being arranged to give three intensities of light.



The rood screen at Canterbury Cathedral illuminated by specially designed bronze floodlight fittings

Metal Finishing Conference

The spring conference of the Institute of Metal Finishing, formerly the Electrodepositors' Technical Society, is to be held at the Grand Hotel, Eastbourne, from Wednesday, 23rd April, to Saturday, 26th April. The first annual general meeting of the Institute will be held

on the Wednesday evening, after which the conference will open with an informal dinner. The technical sessions have been arranged to cover both practical and research aspects of metal finishing. The subjects include the polishing of metals by mechanical and electrolytic means, metal evaporation, alloy plating, plating on aluminium, the structure of electrolytic coatings and an open discussion on methods of combating the nickel shortage. There will also be a full complement of social functions for both delegates to the conference and their ladies.

Factory Constant Load Installation

An electrical installation with a constant maximum demand is an objective which both electricity supply authorities and consumers strive to attain. Such an ideal arrangement, with its obvious economic advantages, has been achieved at the Armstrong Cork Company's factory at Kingsbury, London, by the use of an electrode boiler for process heating, so arranged as to take only the difference between the actual and maximum factory load. That is to say, the process heating load is so regulated that, with the motive power and lighting load, it never exceeds the normal maximum demand of the factory excluding the heating.

To this end a Bastian & Allen 150 kW 415 V electrode steam boiler has been installed with an extra control panel designed to over-ride the normal boiler load control when the factory load approaches the maximum demand. Two ammeters indicate the boiler load and total factory load being taken. The boiler is a standard unit fitted with the maker's "Pressuretrol" automatic regulating device. It is isolated by a Statter 300 A oil circuit breaker. A B.T.H. motor with Crabtree push-button starter is employed for the pump which supplies water to the steam boiler from the feed tank.

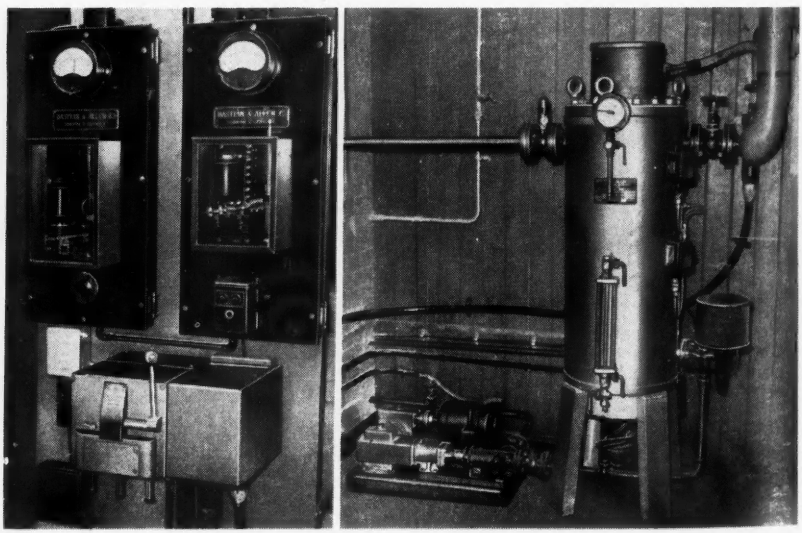
Refrigerator Conference

Service managers representing "Coldrator" distributors from all parts of the country took part in a conference at the Service and Repair Department of International Refrigerator Co., Ltd., London, on 22nd and 23rd January. Discussion followed two sessions devoted to condensing units and talks on such topics as the design of commercial equipment, the service school, installation and service, the organization of a service office and efficient servicing. Mr. C. A. Cornell presided at the conference.

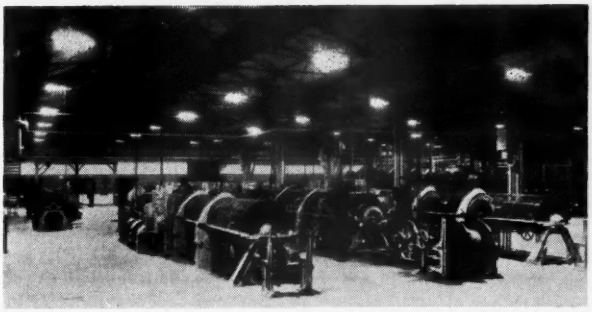
Electrical Imports of Bolivia

A decline in the imports of certain classes of electrical equipment is reported by Mr. H. J. Legg, formerly First Secretary (Commercial) to H.M. Embassy, La Paz, in his review of the economic and commercial conditions in Bolivia (H.M. Stationery Office, 1s 6d net). Mr. Legg states that the volume of dynamos, motors and transformers was 566 metric tons in 1938, but had

Electrode boiler installation at the Armstrong Cork Company's factory showing (left) two control panels which keep the heating load within the normal maximum demand of the factory



declined to 434 metric tons in 1948. Large increases have, however, taken place in the imports of electric wiring, batteries, dry cells, and domestic electrical equipment, which, although still of comparatively small volume, are becoming in greatly increased demand. The latest available figures of generating capacity of power stations in Bolivia are for 1947, when the total installed capacity was 73,476 kW, of which 55,494 kW was installed in hydro-electric power stations.



Henley's factory, Birtley, illuminated by "Mazda" blended lighting fittings

High-Voltage Circuit Breaking

A special course of six lectures on high-voltage circuit breaking and allied problems is to be given at the Polytechnic, 307–311, Regent Street, London, W.1, by members of the staff of the British Electrical and Allied Industries Research Association on Fridays at 6.30 p.m., commencing on 29th February, 1952. Each lecture, which will be illustrated by slides and in some cases by demonstrations, will be of about one and a half hours' duration and each will be followed by a discussion.

The course is practical and non-mathematical in emphasis, and it will be suitable for advanced students and engineers in industry. Further details and application forms may be obtained on application to the Head of the Electrical Engineering Department and should be completed before the date of the first lecture. The fee for the course is 20s.

Aluminium Specifications

Recent alterations to many of the British and American specification numbers for aluminium casting alloys have made it necessary for Alar, Ltd., a technical association of light alloy refiners, to revise the "Related Specifications" data sheet which it first published in 1949. Copies of the revised sheet can be obtained from Alar at 3, Albemarle Street, W.1.

Lighting of Henley's Birtley Factory

"Mazda" blended lighting has gained wide popularity as a means of providing high-bay lighting in industry since it was first manufactured for the Steel Company of Wales project at Margam. Among recent installations of this type of lighting, one of the most important is in the factory of W. T. Henley's Telegraph Works Co., Ltd., at Birtley. Some 150 "Mazda" T206 fittings are employed, of which 132 illuminate the main factory building. Each unit has a 400 W mercury vapour and a 500 W tungsten lamp and is mounted at a height of 17ft from floor level. This arrangement of fittings ensures a high level of illumination over the entire working area, and makes for maximum efficiency and safety in production.

Refrigeration Industry Luncheon

The British Refrigeration Association has arranged a luncheon for 14th March at the Connaught Rooms, London, W.C.2.

Packaging Code

Exporters of non-metallic materials often have to contend with spoilage of their products resulting from attack by moulds, bacteria, insects, mites or rodents. The avoidance of such attack presents a difficult problem because it is necessary in each instance to consider the compatibility of possible protectives with the article itself and with the material from which the container is made. Packers can assist in guarding against damage if the article cannot be protected during manufacture, and guidance in this matter is contained in the newly published Section 5 of the British Standard Packaging Code, B.S.1133 (price 2s from the British Standards Institution, 24, Victoria Street, London, S.W.1).

Manchester Free Trade Hall

Amplifying the reference to its piano lift in our article on the Free Trade Hall, Manchester (*Electrical Review*, 1st February), Knight Theatre Equipment, Ltd., says that the lift, which can be fixed at stage level, can rise 2ft 6in above that level, and can drop down to basement level. It is to be used for taking down and storing the piano or loudspeakers, and when it brings the loudspeakers up it raises them sufficiently high above the stage to put them in their proper position in relation to the picture screen. In addition to the lift there is a rolling, rising trap mechanism to cover the hole left in the centre of the concert platform when the lift has gone down. This rolling, rising platform is driven by a single motor

which traverses it from its "away" position until it is under the open trap and then causes it to rise on a series of ramps. The lift and the platform are fully electrically interlocked.

Steel Castings

The latest in the series of B.S.F.A. Bulletins (British Steel Founders' Association) deals with the design and buying of steel castings. It also includes a summary of chemical composition and mechanical test requirements of British Standards for steel castings, together with designations of other equivalent British and American specifications.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	.. ..	ton £148 0s 0d
COPPER, H.C. Electro	.. ..	ton £227 0s 0d
Fire Refined 99·7 per cent	..	ton £226 0s 0d
Fire Refined 99·2 per cent	..	ton £225 10s 0d
COPPER Tubes	.. .. ..	lb 2s 2d
Sheet	.. .. ..	ton £280 0s 0d
H.C. wire and strip	.. ..	ton £254 0s 0d
LEAD, English	.. .. ..	ton £171 10s 0d
Foreign	.. .. ..	ton £170 0s 0d
MERCURY	.. .. ..	flask £73 10s 0d
TIN	.. ..	ton £985 0s 0d
ZINC, G.O.B. Foreign	.. ..	ton £190 0s 0d
Electrolytic	.. .. ..	ton £194 0s 0d
BRASS Tubes	.. .. ..	lb 2s 1d
Sheet	.. ..	lb 2s 4½d
Wire	.. ..	lb 2s 7¼d
PHOSPHOR BRONZE		
Wire	.. ..	lb 3s 7½d
RUBBER, No. 1 R.S.S. spot	..	lb 37½d–38d

Blackwall Tunnel Lighting

Dorman & Smith, Ltd., inform us that their "DS" fused plugs were employed in the lighting of the Blackwall Tunnel dealt with in our issue of 1st February.

Refrigerating Equipment for Brazil

The Director of the Port of Rio de Janeiro is anxious to place orders in the near future for refrigerating equipment sufficient for a total warehousing capacity of 10,000 tons of meat. Further information is available from the Board of Trade, Commercial Relations & Exports Dept., Horse Guards Avenue, London, S.W.1, quoting C.R.E./4548/52.

Postponed Functions

The annual dinner of the Institution of Heating and Ventilating Engineers, which was to have taken place at the Savoy Hotel, on Wednesday last, has been postponed until Tuesday, 11th March.

The luncheon of the Electrical Trades' Commercial Travellers' Association which was to have been held to-day (Friday) will now be held on Friday, 7th March, at the Connaught Rooms, Great Queen Street, London, W.C.2.

The Electrical Research Association is holding its annual luncheon at the Connaught Rooms, W.C.2. on Friday next, 22nd February.

The dance organized by the Birmingham Branch of the Electrical Industries Benevolent Association, which was to have been held at the T.I.S.C. Ballroom, Oldbury, to-day (Friday), has been postponed until Friday, 29th February.

Television Aerial Lectures

A series of lectures has been arranged by Aerialite, Ltd., to be held in Scotland, on the "Design, Construction and Erection of Television Aerials," for members of the trade. The lectures so far arranged are:—26th February, Central Halls, Glasgow; 27th February, Marryat Hall, Dundee; and 28th February, Central Hall, Edinburgh.

Trade Announcements

All communications and goods for the **Rainville Engineering Co., Ltd.**, should now be addressed to the company's new factory at 148, Frimley Road, Camberley, Surrey (telephone : Camberley 2345).

James Stott & Co. (Engineers), Ltd., have opened a new depot at 14, John Street, Bristol (telephone : Bristol 24908), under the management of Mr. A. W. Teall.

Catalogues and Lists

Saniguard Appliances, Ltd., 62, London Wall, London, E.C.2.—Illustrated price brochure on the "Barrywald" automatic sanitary incinerator.

Shelford Bidwell & Co., Ltd., Caxton Works, Garth Road, Morden, Surrey.—Illustrated folder describing the company's range of enameloid and vitreloid industrial signs and price list.

Standard Telephones & Cables, Ltd., Telephone Division, Oakleigh Road, New Southgate, London, N.11. — Illustrated technical booklet (D/RC.17) on terminal link blocks.

Courtney, Pope (Electrical), Ltd., Amhurst Park Works, Tottenham, London, N.15.—Illustrated priced folder on window and display lighting fittings.

English Electric Co., Ltd., Switchgear Department, Stafford.—Technical publication on metal-clad horizontal drawout switchgear (SG/210).

Unity Heating, Ltd., Chilworth Manor, near Southampton.—Price lists of the "Floodwarmth" range of tubular heaters.

C. A. V., Ltd., Acton, London, W.3.—Illustrated catalogue of trolley-bus low voltage equipment.

Distribution Economics

Supplies to Housing Estates

THE design of networks for supplying electricity to housing estates formed the subject of a Supply Section paper which was presented by Mr. F. G. Copland (North Western Electricity Board) at an ordinary meeting of the Institution of Electrical Engineers on 7th February.

Starting with the assumption that a revenue return of at least 50 per cent on new capital was requisite to maintain the present balance of accounts, the author postulated that the layout should provide for the load growth during the amortization period of 40 years now stipulated for underground cables. A scheme should, he said, envisage 3 kW as the ultimate after-diversity maximum demand per consumer, based on 2·3 kW for the present well-electrified house plus 0·7 kW to cover additional space heating. The a.d.m.d., which would probably occur at noon on Sundays, would produce 4 kW phase load with 50 per cent phase unbalance. On the winter weekday system maximum demand at 8.30 a.m. the domestic after-diversity demand would be 0·7 of its maximum.

Assuming a uniform growth in domestic load factor from 25 to 50 per cent in the 40 years, the average of 37·5 per cent gave a load factor of losses of 18·7 per cent. Thermal and voltage drop considerations prevented attainment of the highest copper economy secured by equality of annual cost of losses and size of conductor, and the nearest approach to this condition was achieved by loading cables to maximum current-carrying capacity.

Analytical treatment was then applied to a symmetrical network, from which mean losses and maximum voltage drop were derived and costs calculated for seven standard sizes of cable. In estimating the costs excavation was taken at 6s per route yard, copper at £200 per ton and lead at £100 per ton; material and labour charges included on-costs of 5 and 25 per cent respectively.

The application of the method suggested to a housing estate now being built was described with a cost comparison of three different types of distribution. From tabulated data of the relevant factors it appeared that the use of 0·06 sq in cable would ensure the minimum cost, though 0·10 sq in would be justified in exceptional conditions. With common trenching of high and low voltage cables, and allowing for the requisite substations (the number of which would vary with the size of cable conductors) it was claimed that networks adequate for ultimate loads of 3 kW a.d.m.d., with 50 per cent unbalance (i.e., 4 kW in one phase and 2·5 kW in the others with 1·5 kW in neutral) would cost about £25 a consumer, excluding service connections, compared with £40 for present standard methods catering for loads of little more than 1·5 kW.

No provision was made for alternative supplies on account of cable breakdown. Records over ten years relating to 1,300 miles of l.v. cable, some of it aged, in the North Western Area, showed that the annual fault incidence had been only 1·8 per 100 miles. A 400 yd distributor supplying 32 consumers would carry a chance of six to one against a fault in 40 years. For 6,000 distribution transformers the incidence was three per 1,000 per annum, a risk of eight to one against. High voltage cables suffered six faults per 100 miles per annum.

DISCUSSION

Mr. O. Howarth (N.W. Electricity Board) said, in opening the discussion, that while they were satisfied that the figure of 3 kW after-diversity demand given by the author was a safe maximum, there was considerable evidence that housing estates with solid fuel heating and electricity as the only alternative service had an after-diversity demand of less than 1 kW a house.

Shortly after vesting day various schemes for supplying housing estates on conventional lines had been put before his Board which would have cost approximately £60 a house,

including services. The average domestic consumer took 1,300 kWh annually and produced a revenue of about £8 a house, which was not a commercial proposition; in spite of being nationalized, they were a commercial enterprise. The necessity of reducing the capital cost of affording a supply called for an alteration of conventional methods. The Board connected about 10,000 houses a year on housing schemes and at a total cost of £40 a revenue of £8 was equal to 20 per cent of the capital figure, which most undertakings had regarded as satisfactory in the initial stages.

Electricity Boards had been criticized for trying to persuade domestic consumers to make greater use of electricity, but Mr. Howarth gave figures showing that the domestic peak period did not coincide with load-shedding times and that the domestic load was greater on Saturday and Sunday than during the rest of the week.

Revenue and Cost

Mr. D. B. Irving (London Electricity Board) maintained that the old concept of relating the immediate revenue return on a particular extension to the capital cost of that extension, with no regard to previous capital expenditure, must give way to a consideration of the picture as a whole. Those concerned with distribution must remember that they had been able to carry on so far mainly because of the reserve strength provided in distribution systems by former generations of engineers. If in their planning to-day they did not provide a reserve for those who came after them, they would be doing them and the country a disservice.

Mr. R. H. Abell (Southern Electricity Board) said that on the basis of twelve examples his Board found that the cost of providing a supply to housing estates was about £30 a house with modern designs. A balanced load was very important; their unbalance was of the order of 20 per cent. The average return on the estates to which he referred was £10 to £15 a house.

Mr. W. Hill (Midlands Electricity Board) suggested the use of under-eaves construction for the last ten to twenty houses on each distributor, which should cut service costs to about one-third and prevent bad out of balance. He also suggested reasons for which it might be possible to up-rate cables by 30–35 per cent.

Mr. G. H. Fowler (London Electricity Board) contended that the author had achieved economies in two main ways: by having absolute faith in his knowledge of the future and by abandoning the traditions of the former electricity supply engineer. A number of networks in the country to-day had been designed on a graded system, gradually reducing the diameter of the cable, the designers thinking that they knew where the load was going to be; they were the ones which caused the most trouble, because they could not be reinforced. Was the author in any better position to forecast the future than the designers of those days? Mr. Fowler deplored the throwing overboard of continuity of supply, holding that what they were really selling the consumer was not electricity but a service. The time might come when they would charge for it not on the basis of kWh but as a service, as was now done with water.

Mr. P. Schiller (B.E.A.), emphasizing the importance of work of the type done by the author, said that from figures recently collected he was afraid that a substantial number of housing estates had been connected since the war at a cost of £50–£60 a house. One advantage of being a nationalized industry was that this kind of problem could be tackled by experts. One should be wary of talk of the load factor approaching 50 per cent in 40 years, because that could probably be achieved only by the use of load control, and there would not be much support for that kind of development.

Average Consumption

Mr. R. A. W. Connor (Eastern Electricity Board) suggested that the author's figure of 1,000 kWh as the consumption by a new consumer in the first year of supply was low; in the area with which he was concerned the average figure was about 1,500 kWh and the average revenue per house was over £8, and from new housing estates might well be over £10. The industry in the past had built its business on attractive tariffs and abundant and continuous supply. While they must now spend their limited money to the best advantage, they must keep away from what the author called the "border line of irritation" of the consumer, where the fact that a few electric fires were put in might cause a voltage drop.

Mr. B. D. Youatt (Yorkshire Electricity Board) said that although there was very

good theoretical justification for a network of 0·025 sq in conductors, and they would save a lot of copper, it was just as well to leave themselves plenty of elbow-room in such "tailor-made" networks, otherwise expensive reinforcement might be needed in the future.

Mr. B. Crowsley questioned the author's statement that the domestic consumer was subsidized by other consumers and also thought that 3 kW for the after-diversity maximum demand per consumer was very high. In a district with a saturation of 60 per cent cookers and a high degree of saturation of other apparatus the average maximum demand on the station busbars, he said, was just under 1¼ kW on weekdays and just over 1½ kW on Sundays.

Mr. G. W. Lee expressed the view that the value of the paper was in its use of an analytical approach which had produced a "ready reckoner." He did not agree with the author's conclusions (in fact he hardly agreed with anything in the paper), but he regarded the ready reckoner as of great value, because at least he knew what it was that he was not agreeing with.

Mr. J. Eccles, challenging the statement that the domestic consumer was subsidized from other loads, said he would be glad to take over all the author's domestic consumers along with his own and make a profit, while the author, keeping the others, would make a loss.

Mr. J. L. Egginton suggested that in many cases it paid to run a distributor down one side of the street only and take services across the street to blocks of two or four houses.

Mr. E. C. I. Macdonald recalled that 25 years ago Messrs. Beard and Haldane had written a paper on the same subject and arrived at many conclusions similar to those of the present paper. They differed from it, however, on the question of cable sizes and in contemplating a progressive expansion of load, so that they achieved considerable economy by not spending money on material and work which were unnecessary in the early stages.

The author briefly replied.

The I.E.E. and the late King

At a meeting of the Council of the Institution, held on 7th February, a resolution was passed expressing on behalf of the President and Council their sense of the profound loss sustained by the British Commonwealth of Nations through the so much lamented and so sudden death of His Majesty King George VI who was Patron of the Institution. The resolution also conveyed to Her Majesty the Queen, and the other members of the Royal Family, their profound sympathy, and assured Her Majesty of their unflagging loyalty and devotion.

At the ordinary meeting of the Institution on 7th February the Council's action was unanimously endorsed, the members present standing in silence.

Electron-Trajectory Determination

New Method Described

At a meeting of the Radio Section of the Institution of Electrical Engineers in London last week a new method of determining electron trajectories in an electrostatic field was described in a paper prepared by Messrs. K. F. Sander, C. W. Oatley and J. G. Yates (all of the Engineering Laboratory, University of Cambridge). By this method information derived from a model electrode system in an electrolytic tank is passed automatically and continuously to a differential analyser, where the equations of motion of the electron are integrated and its trajectory is traced on an output table.

Electro-field components in the tank are sampled by means of pairs of probes dipping to the electrolyte and the voltage between the two probes of each pair is balanced automatically on a potentiometer and is thus converted into a shaft rotation which can be fed into the differential analyser. The output shafts from the analyser determine the mean position of the probes in such a way as to follow the trajectory which is being plotted.

Results obtained with apparatus based on these principles are described, and a detailed analysis of the factors affecting the overall accuracy is included in the paper. The authors conclude that the method is a promising one, but that a digital computer would give much more satisfactory results than the differential analyser which was used.

NEW BOOKS

Advanced Theory of Waveguides. By L. Lewin. Pp. 192; figs. 54; index and bibliography. Published for the *Wireless Engineer* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 30s.

In recent years a considerable mathematical effort has been expended on those parts of waveguide theory which involve discontinuities in the structure—diaphragms, junctions, open-ended guides, etc. The methods are essentially complicated and are beyond the scope of most books although the results are usually quoted and are widely used in design work.

Mr. Lewin's book attempts to fill the gap by presenting the mathematics of the methods used in as simple a form as possible, but it is still " advanced theory " and the reader must have a rather substantial background of function theory if he is to read it with profit. Familiarity with the fundamentals of the theory of waveguides and with their application is assumed, so that results once derived are not further discussed. This means that although the number of pages is not large quite a lot is packed into them. The subjects dealt with are posts and diaphragms, steps, junctions, and tapers in waveguides; then there are chapters on radiation from waveguides, and on loaded guides. The book ends with a comprehensive bibliography.

The author is to be congratulated on his presentation of a difficult subject, and on compiling material so much of which has hitherto been available only in reports of limited circulation.—H.R.L.L.

Autobiography of Robert A. Millikan. Pp. 334; index. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 21s.

This is a book to read with relish page by page and then to keep. If you are old you will take it down from your shelves often enough to make your guinea a sound investment; if you are young you will be buying a gold mine which will bring profit all your days.

The progress of physical science over the past 60 years is terrifying in its extent and implications and few of us can keep abreast of the wave, but in this delightful autobiography we have an ideal and palatable way of informing ourselves on its intricacies.

There is no better way of studying an epoch in the history of a nation, a movement or a branch of knowledge than by following the thoughts and achievements of an individual who is stimulated and inspired in the field concerned. In physics few men have worked as assiduously over the past half century and more as Millikan and the personal life of no man has been so closely associated with the scientific development of the period.

Born in 1868, within a few months of Clerk-Maxwell's epoch-making communication to the Royal Society, he early displayed strength of body and mind which led him to crowd into 63 years of academic life a wealth of successful enterprise. A wise man who has lived a full, generous, inspired life cannot give us too much of this distilled wisdom, particularly when he writes as Millikan does.—P.D.

Principles of Lighting. By W. R. Stevens. Pp. 482+x; figs. 200; index. Constable & Co., Ltd., 10-12, Orange Street, London, W.C.1. Price 35s.

This is undoubtedly the best book on illuminating engineering that has ever been written. Although very practical and based on the author's long and wide experience in the design of lighting installations of all kinds, it includes five excellent chapters on fundamental principles, vision, colour, photometry and light sources respectively. The design of fittings is dealt with in two chapters which reflect the author's particular interest in this subject and then, after a chapter on the bases of installation design, the special fields of lighting are dealt with *seriatim*.

In addition to the more obvious ones, the lighting of motion picture studios and theatre stages, floodlighting and decorative lighting are included. There is also, perhaps surprisingly, a chapter on daylight and the final chapter covers a wide variety of topics which do not naturally come into the preceding chapters. The book is very well illustrated and for his examples of good lighting the author has not confined himself to this country alone. The production is very pleasing and there is a good index. Without doubt, the book should contribute notably to interest in lighting and its advancement, not only in this country but also abroad.—J.W.T.W.

Metal Alloying

Continental High-Vacuum Furnace

By a Correspondent

THE melting of metals for the manufacture of special alloys has hitherto been done in a controlled atmosphere to minimize oxidization of the melt in the presence of air within the furnace. More modern equipment avoids such contamination by, for instance, enclosing the furnace and mould with hopper charging device in a large vacuum chamber, which is arranged to enable various additions to be made to the melt in proper sequence and permit observation of the progress of the operation.

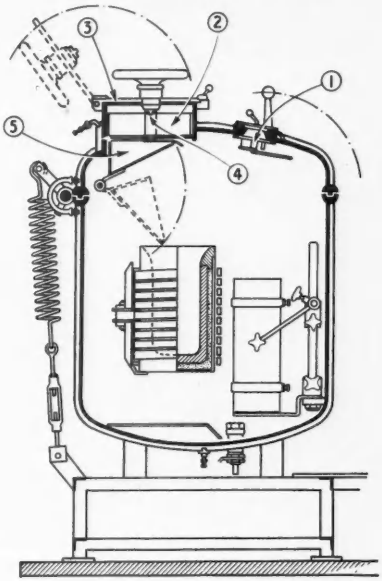
One of a series of such plants developed by Geraetebau-Anstalt Balzers, Liechtenstein, via Switzerland, is shown (Fig. 1) with the cover of the vacuum chamber lifted, looking down into the crucible with the upright mould alongside. The principle of operation can be followed more readily on reference to the sectional representation of the vacuum chamber (Fig. 2), which is of stainless steel construction with double walls, both chamber and cover being arranged for water cooling. The cover is provided with a counterbalancing spring to enable it to be raised readily by hand. The progress of the melt can be observed through a double inspection window (1) which can be protected against vapour by an internal plate and cleaned, when necessary, by an internal wire brush, both of which are operated by an external handle.

The furnace proper is of the electrical induction type and, for pouring, both the crucible and its surrounding coil are tilted about a point just below the lip so that the metal flows into the mould immediately alongside. Fig. 3 shows the crucible in the position it assumes when it has been entirely emptied. The tilt is effected by a hand lever outside the vacuum chamber.

Melting is started with a basic charge in the crucible and, for adding material

Fig. 1.—High vacuum melting chamber with cover lifted

Fig. 2.—Sectional representation of induction crucible within vacuum chamber



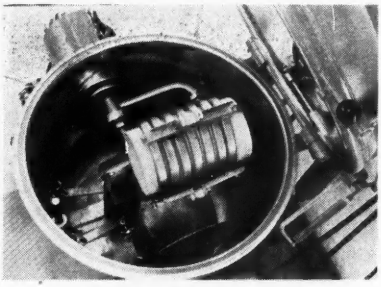


Fig. 3.—Crucible in position it assumes when entirely emptied, with mould alongside

during the progress of the melt, the vacuum chamber cover is provided with a rotating hopper (2) divided into six vertical compartments, to which access is obtained through the auxiliary cover (3). These compartments are filled with the necessary material in the sequence in which the additions are required to be made; by means of the hand-wheel (4) the hopper can be rotated so as to bring each compartment over an aperture through which the contents drop into a scoop (5), the latter being then tilted by an external lever to slide the material into the crucible. The mould is locked in the vertical position in front of the pouring point of the crucible upon a supporting plate, the latter being adjustable for height by means of the hinged arms shown so that moulds of various dimensions can be used. Water cooling can be employed when required, the necessary connections being provided at the bottom of the vacuum chamber.

By the use of suitable insulating material, temperatures up to some 2,000 deg C can be obtained in the crucible, which enables the melting of a wide range of special alloys to be carried out. Both melting times and electricity consumption do not vary materially from the results given for normal induction melting, although it will be appreciated that in certain cases the volume of gas given off might make a somewhat longer melting time advisable.

The high vacuum pumping set is combined with the vacuum chamber to form a compact melting equipment. The former consists of a two-stage rotary backing pump, a three-stage diffusion pump with baffle (so arranged that it can also be used as a booster pump when large volumes of gas have to be drawn off) with a backing vacuum reservoir and valve assembly unit. The capacity is such that the average pumping time with empty crucible is five minutes to exhaust down to 10^{-2} mm Hg or ten minutes to 10^{-4} mm Hg of vacuum.

Development in Madras

Government Electricity Department's Report

GENERATION of electricity in the State of Madras is almost entirely controlled by the Government Electricity Department which is also largely responsible for distribution. As part of its 1951–52 programme the Department proposed to acquire all the remaining 28 local authority undertakings, but this has been upset by a recent ruling in the Madras High Court that the Madras Electricity Supply Undertakings (Acquisition) Act, 1949, is *ultra vires* in so far as it relates to local authorities.

During the period covered by the Department's latest report (1950–51) the continuing shortage of plant capacity made it necessary to limit development and cuts in supplies were imposed between February and April last year because of unsatisfactory water conditions in the Mettur catchment area. Power demands on the Government system aggregated 147,500 kW and 681·6 million kWh was generated (compared with 129,137 kW and 605·8 million kWh in 1949–50). Of the total output, 510·2 million kWh was generated at hydro-electric stations. Industrial consumption accounted for 58 per cent of the electricity sold; irrigation and agriculture for 12 per cent; domestic supplies, 12 per cent; commercial lighting, 8 per cent; public lighting, 3 per cent; traction, 3 per cent; and miscellaneous supplies, 4 per cent.

Consumers served by all the undertakings in the State numbered 275,697 (274,033 in the area covered by Government undertakings). The route mileage of the Department's transmission and distribution network was increased by 1,395 to 9,110 miles during the year; supplies were afforded to a further 224 villages, while licensees connected 64 villages. Good progress was made in agricultural supplies, particularly for pumping equipment.

Work continued on the Machkund and

Moyar hydro-electric schemes and extensions at Pyk ra, Papanasam and Madras City, in addition to three new projects. One of these, the T ngabhadra scheme, provides for the constr tion of two new power houses, together with t nsmission lines and substations, at a total timated cost of Rs 7·33 crores (£5,4 00).

A to supply power to South Kanara from the Jog hydro-electric station of the Mysore Government is estimated to cost Rs 48·3 lakhs (£362,250) and the construction of a third Pykara–Coimbatore–Madurai 110 kV circuit Rs 99 lakhs (£742,500). Total capital expenditure during the year on works connected with the five-year development plan amounted to Rs 7·37 crores (£5,527,500), which again constituted a record.

Electric Furnaces for Steelworks

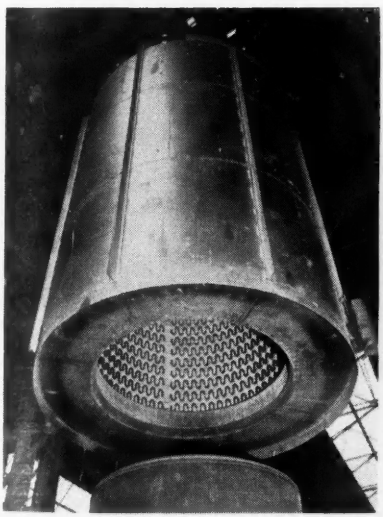
Vertical Cylindrical Bell Type

NEW equipment installed at the Brierley Hill works of Richard Thomas & Baldwins, Ltd., includes six G.E.C. vertical cylindrical bell furnaces which are capable of annealing up to 700 tons of coiled silicon steel strip a week.

Each furnace, which weighs 15 tons and has a full complement of bases and hoods, is required to handle charges up to 20 tons in the form of coils of various widths wound to an outside diameter of nearly 5ft. The coils are mounted as a stack 8ft high in a furnace base and are sealed under a heat-resisting steel hood. The hood is of lightweight construction so that the mass of metal to be heated is kept to the minimum. The furnace bell, which carries the heating elements, is then lowered over the hood and is accurately positioned by means of steel locating posts adjacent to the base.

The heat treatment is carried out at a temperature between 740 and 780 deg C in an atmosphere of cracked and burnt ammonia. The atmosphere is circulated through the charge by a fan unit housed in the centre of the furnace base and passes along an air guide and between plates which separate the coils, before returning through the centre of the coils. The air guide and the separate plates have been designed to take the "swirl" out of the atmosphere before it returns to the fan, as well as to ensure the most efficient circulation.

The furnace elements are constructed from Nichrome strip and wound in sinuous form. Each furnace is rated at 360 kW and has its elements arranged in two three-phase circuits. One circuit is automatically switched off just before the desired working temperature is reached and this 50 per cent reduction in power input minimizes the amount of temperature overshoot at the control point.



G.E.C. vertical cylindrical bell type furnaces in the Brierley Hill works of Richard Thomas & Baldwins, Ltd., and (left) interior of a furnace bell, showing the heating elements

MANUFACTURING PROGRESS—1951

Lancashire Dynamo Holdings, Ltd.

ALL the subsidiary companies of this organization made considerable advances along the lines of their particular activities.

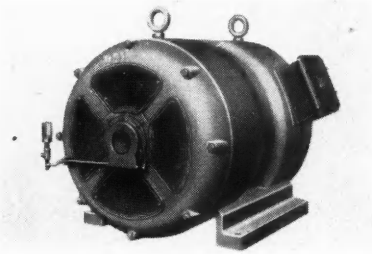
In the field of rotating electrical machinery the "Fankuld" and "Corcooled" ranges of induction motors produced by Lancashire Dynamo & Crypto (Mfg.), Ltd., have been adapted to meet expanding applications at home and abroad, and typical of these developments is a 180 h.p. 2,930 r.p.m. 400/440 V "Corcooled" squirrel-cage motor, a special feature of which is the location of the outboard bearing outside the external fan. This renders the bearing accessible for running temperature measurement and for inspection without the withdrawal of the fan from the shaft.

Alternative bearing housings are available for lubrication by grease or oil, and when oil is used the head of oil in the bearing sump is controlled by a constant level lubricator.

Four larger "Corcooled" motors were specially designed for driving induced-draught fans in a power station in South Africa. Continuously rated at 507/278 h.p. 740/590 r.p.m., 3·3 kV, the dual speeds are given by two separate stator windings. Special housing makes the motor suitable for operation fully exposed to the weather.

Among the orders received by Foster Transformers & Switchgear, Ltd., is one for fifteen 2,000 kVA, 4·4 kV transformers for the Hydro-Electric Power Commission of Ontario. Seventy distribution transformers, ranging in size from 50 to 500 kVA, were shipped to the State electricity authority of Uruguay. There was a considerable increase in the production of voltage regulating equipment for laboratories and for special factory processes. The transfer of switchgear manufacture to Crypton Equipment, Ltd., enabled the company to step up the production of current injection, relay and meter test sets.

Typical of L.D.C. developments to meet new applications is a 180 h.p. "Corcooled" s.c. motor with its outboard bearing outside the external fan



No doubt the principal development of Crypton Equipment, Ltd., was the establishment of the Bridgwater factory for the manufacture of heavy industrial switchgear. Of special interest in this new field was the production of a flush type switchboard for the Crossley Premier Co. This had fifteen cubicle type panels made from steel plate, and it is 27ft long and 7ft 6in high. Fitted with flush type heavy industrial fuse-switches and flush indicating instruments throughout, this switchboard has three different sections for different supply conditions—220 V d.c., 110 V d.c. and 440 V a.c.

A new battery charger which was developed by Crypton enables batteries to be charged with thermostatic control in from 30 to 60 minutes. The charger incorporates an original method of testing batteries to determine their remaining effective service capacity. Research resulted in the final development of the "Hyrolek," which will be an "electric hydrometer" for measuring the state of charge of a battery.

The Nevelin Electric Co., Ltd., extended its range of twin bulb rectifier cubicles to larger outputs. This range extension includes a group of six units with a total output of 3,260 A in a 750 kW bank. A bank of seven cubicles of six-anode glass bulb rectifiers, having a total output of 1,955 A, was supplied to the North Thames Gas Board.

"Varionic" drives with ratings above 500 h.p. were in hand, and more varied applications ranged from a log handling

plant in Canada, with automatic control of the conveyor loading, to a 160 h.p. calender drive in a British paper mill. The use of argon in glass bulb rectifiers was proved to be of considerable value in reducing the incidence of surges. The design of the company's static grid control equipment was modified, and in its latest form gives an increased range of control with greater accuracy.

For the textile, steel and rubber industries Electronic Products, Ltd., developed new applications of multi-motor line drive equipments, both of the fully electronic and the electronic Ward-Leonard types.

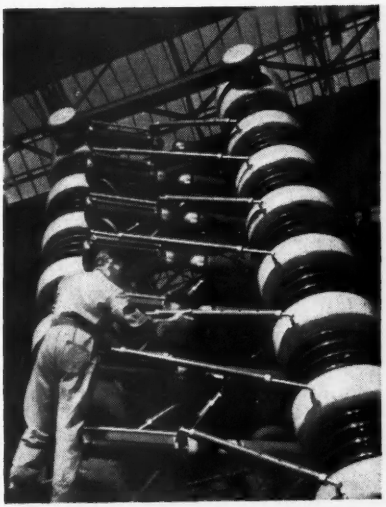
The largest installation of this type commissioned was a fully automatic electronic Ward-Leonard drive for a descaling line in a South Wales steelworks. The equipment controls a number of motors totalling about 200 h.p., and includes all the electrical control gear, as well as intercommunicating telephones, etc.

Ferranti, Ltd.

THE outstanding development of the year by Ferranti, Ltd., was a 1,000,000 V d.c. super voltage cable testing equipment for Norway. Rectification is on the voltage doubler principle, the midpoint of the rectifiers being energized from two 200 kV cascade connected transformers in porcelain housings. This enables the full rating of the rectifiers to be used. The connections are such that the earthed end may be positive or negative. The connections to the rectifiers and the transformers enable sections to be connected in parallel to give lower voltages and higher currents. A resistance potentiometer, a three-range, automatic range change milliammeter and direct reading voltmeter are provided. There is forced oil circulation through the rectifiers and potentiometer for cooling and insulation.

Two control panels are provided, one for permanent installation in the control gallery of the research laboratory in which the equipment will be used, and the other arranged in portable form, incorporating a Ferranti moving coil regulator for output voltage variation. Seven h.v. impulse testing plants were in course of manufacture.

Further extensions to the company's large transformer factory were in progress. At the close of the year contracts for forty-five 220–300 kV transformers totalling about 2,000,000 kVA were in hand, including eight 120,000 kVA 275 kV, three-phase units for the British Electricity Authority. A large contract received from the Aluminum Company of Canada, Ltd., covers a 213,000 kVA, 13·2/301 kV, three-phase bank of generator transformers for the Kemano power station, British Columbia. This power station will be built underground and the generator transformers will be installed in cubicles hewn out of the solid rock, adjacent to the generators some 300ft below the surface.



Ferranti h.v. impulse testing plant in course of construction; final assembly stage

Also included in this contract are transformers composing a 111,000 kVA, 275/13·2 kV, three-phase bank which will step down the voltage at Kitimat where the aluminium reduction plant is situated. This transformer bank will be installed in the open, operating under most severe weather conditions. Forced oil circulation with forced water cooling will be used in all the transformers, with the company's

directed oil flow winding construction. Two 64/64/32 MVA, 231/115·5/10·5 kV, three-phase transformers were commissioned in Finland. At home steady deliveries of large generator and transmission transformers were made to the British Electricity Authority and Electricity Boards. Several standard types of urban and rural distribution transformers were developed to suit customers' general requirements and to increase the rate of production.

Ferranti moving coil voltage regulators are being employed in many industrial applications in addition to their use in the solution of voltage regulation problems in transmission and distribution circuits. Two more industrial applications of the Ferranti moving coil voltage regulators were the control of voltage to biscuit making ovens and heat treatment furnaces. These have necessitated development of special control circuits to maintain the temperature within very close limits.

For d.c. circuits supplied from a.c. source through rectifiers, in which the d.c. voltage must be maintained within close limits, a d.c. actuated astatic relay has been developed to control the moving coil regulator supplying the input to the rectifier. Moving coil regulators ordered during the year include five 2,840 kVA, 3,810 V units for Brazil, two 500 kVA, one 700 kVA and one 1,600 kVA, 11 kV regulators for Australia and New Zealand, nine 11 kV units for Ireland and 85 equipments for Argentina.

Electricity in Mines

THERE were 1,663 mines at work in 1950; of these 1,404 were collieries at which 723,000 persons were employed. In his report for that year just issued (H.M. Stationery Office, 1s 9d net), Sir Andrew Bryan, Chief Inspector of Mines, records that fatalities numbered 493 and reportable injuries 2,020. Included in the former were two deaths due to electric shock. One occurred on the surface during the reconstruction of an old switchboard in a power station. The other was caused by damage to a live unscreened flexible cable supplying a coalcutter when the cable was caught by moving cutter picks. In addition two of six men who received burning injuries from an ignition of firedamp died in hospital; the cause was presumably open sparking at the slip rings or controller of a haulage motor which were not of flameproof design.

Non-fatal electrical accidents numbered 56 (41 underground) and resulted in injury to 64 persons (including 31 electricians). There were also 17 dangerous occurrences. Of 18 explosions and 22 ignitions of firedamp, nine were attributable to electricity. Damaged flexible cables associated with coalcutters were responsible for three ignitions of firedamp and one fire, all in safety-lamp pits.

The Chief Inspector says that where possible the gate-end box should be so arranged that the flexible cable feeds the machine at the front or haulage end. Otherwise the cable should be carried over the cutting end of the machine by a "fair-lead," a design for which is suggested in the report of the Principal Electrical Inspector for 1950.

Fires involving drill cables at the coal face have occurred with some designs of gate-end switches unprovided with adequate automatic overload protection. Fires have also been caused by direct connection of the small cables used with solenoid or thrustor apparatus of brakes to the terminal boxes of large conveyor motors. Electrical protection should be provided, preferably by a small circuit breaker interlocked with the main motor switch rather than by fuses.

Belt conveyors represent the greatest single fire hazard in coal mines—100 between 1940 and 1950 (inclusive). Of these electricity caused six, half of which were caused by defects in solenoid brakes. Other fires during the same period numbered 300 underground and 84 at the surface. Electricity was involved in 116 of the underground fires (including seven at inbye compressors and ten at haulage engines); faults in armoured cables (29) and flexible cables (37) predominated, 11 being due to strata movement and five to the cutting of trailing cables by coal picks. At the surface, two fires were caused by electrical defects and 22 by flame cutting and welding apparatus, including oxy-acetylene.

ELECTRICITY SUPPLY

Reserve Returned to Board

Proposed Hams Hall "C" Station

The S.E. Scotland Electricity Consultative Council announced at a meeting in Edinburgh last week that the B.E.A. had returned a specific reserve of £84,413 to the Board. This was not part of the general reserve of £1,050,000, which the Central Authority still held, but represented specific reserves held by various undertakings in the S.E. Scotland Area on vesting day. From the returned amount £20,000 would be set aside to cover "bad and doubtful debts" and £22,000 to meet superannuation liabilities. The remaining £42,413 would be transferred to the current revenue account. It was further reported that the Central Authority had approved recommendations which aimed at providing a more equitable method for the payment of rates in the S.E. and S.W. Scotland areas.

Hams Hall Inquiry

The proposed construction by the British Electricity Authority of a "C" station at Hams Hall was the subject of a recent Ministry of Fuel and Power inquiry conducted by Mr. A. N. East. There were fifteen objectors whose main complaint concerned grit and dust. The new station is to be built between the "A" and "B" stations and when completed will contain six 60,000 kW sets. There will be two 400ft chimneys and three 325ft cooling towers. The contention of the objectors that the dust problem will be worsened was refuted; it was hoped, in fact, that conditions in the area would be improved. The thermal efficiency would be such that less coal would be used.

The need for the new station was emphasized by Mr. R. R. Maddock, chief generation engineer (construction), B.E.A. Midlands Division, who said that one unit was planned to be in commission in 1955, two more in 1956 and the remainder in succeeding years. In reply to questions he said that when the "C" station had been built the "A" station would go out of commission. He had not heard of a project for a "D" station. It was anticipated that 70 per cent extraction of grit would be achieved with the mechanical extractor and 96 per cent of the remainder with the electrostatic device.

Mr. F. W. Skelcher, chief generation engineer (operation) of the Division, said that the new station would not be a base-load plant. The question of atmospheric pollution was constantly under review. Observations at Hams Hall "B" had shown that the grit extractor plant was not as efficient as had been hoped and modifications were in hand.

Road Lighting in Lanarkshire

Several road lighting schemes have recently been completed in Lanarkshire with equipment supplied by the British Thomson-Houston Co., Ltd. Along the Glasgow–Carlisle and Glasgow–Cumbernauld roads, "Mazda" enclosed type lanterns (SL721) house 140 W sodium vapour lamps. On the former highway the new sodium lighting is continuous for 7½ miles, one of the longest unbroken stretches of this kind of illumination in Great Britain. The lanterns are mounted at a height of 26ft with an average spacing of 120ft. On the Glasgow–Cumbernauld road a mounting height of 25ft has been adopted with an average spacing of 115ft. Mercury vapour lighting is employed along the A776 Hamilton–East Kilbride and the

Lighting for an unbroken stretch of 7½ miles on the Glasgow to Carlisle road is provided by "Mazda" sodium lanterns housing 140 W lamps

A723 Motherwell–Hamilton roads. In both cases, lanterns are of the "Mazda" SL700 enclosed type housing 250 W lamps. Mounting height and spacing are the same for each installation (25ft and 120ft).

Installations in Schools

The London County Council Education Committee reports that it is proposed to invite tenders for the installation of electricity in ten primary and secondary schools and one special school in the first group of the sixth programme. The schools concerned are Wilberforce (Paddington North), Christopher Hatton (Holborn and St. Pancras South), Thomas Fairchild (Shoreditch and Finsbury), George Lansbury (Poplar), Canterbury Road (Deptford), Heber (Camberwell and Dulwich), Flint Street (Southwark), John Burns (Battersea South), Canonbury (Islington East), Virginia (Bethnal Green) and Springwell House (Battersea South). Of the total estimated expenditure of £40,185 it is expected that £2,000 will be incurred in the current financial year, £36,585 in 1952–53 and the remainder in 1953–54.

Joint Meter Reading

The North Western Electricity Consultative Council has informed its counterpart in the gas industry of its objections to the proposed joint reading of gas and electricity meters. It says that when all the facts are taken into consideration it has been found that the administrative work in co-ordinating the sequence of readings and the subsequent separation in analysis and audit nullifies any savings in the actual outside work of visiting the premises. In practice it is found that consumers who have prepayment meters for gas do not necessarily have prepayment meters for electricity and vice versa. Generally the gas prepayment meters are 1d in the slot, whereas electricity meters are usually 1s. It is also pointed out that the Gas Board's organization could not be expected to be sub-divided into identical districts, and this factor alone made co-ordination impossible, even if it were desirable.

High-Voltage Cable

Coulsdon and Purley U.D.C. has approved an application by the South Eastern Electricity Board to lay an 11 kV cable across Rickman Hill, Coulsdon, terminating at a proposed substation.

Electricity in Caithness

Capital charges proposed by the North of Scotland Hydro-Electric Board for supplying electricity to Council houses in Caithness were criticized when County Council representatives met Sir Hugh Mackenzie, deputy-chairman of the Board, at Wick recently. Sir Hugh stated that, since the Board took over responsibility for distribution of electricity in Caithness four years ago, the number of consumers connected had increased from 3,083 to 3,972. When extensions now in progress were completed the Board would have connected about one-third of the agricultural premises in the county, and that was about the present proportion of farms connected to the mains in the rest of Britain since electricity supplies first began. At present the Board was subsidizing electricity supply to Caithness to the extent of more than £[illegible],000 per annum.

Charges in S.W. Scotland

Mr. W. Hutton, deputy-chairman of the S.W. Scotland Electricity Board, announced last week that the new standard commercial tariffs (*Electrical Review*, 1st February, p. 250) would take effect from 1st March. He added that the price of electricity for domestic, farm and public lighting purposes would be increased by about 8 per cent from 1st June this year at the latest, saying that last year the Board's deficit was £100,000, but this year it was expected to be nearer £500,000.

Electricity for New Houses

The South West Scotland Electricity Board has approved a scheme estimated to cost £58,000 for supplying electricity to 1,456 houses which are to be erected by Glasgow Corporation at Ruchazie housing estate, Carntyne. The scheme will involve the laying of high and low voltage cables and the construction of three electricity substations.

Australian Electrification Plan

A plan for the complete electrification of Victoria, bringing the benefits of electricity to nearly every home and farm within the next ten years, has been submitted to the Government of Victoria by the State Electricity Commission. The programme, however, was prepared before restrictions of finance curtailed the Commission's works, and the completion of it by the target date of 1961 will obviously depend upon adqeuate finance.

The estimated cost is some £45 million. As an essential corollary the Commission proposes that the ten municipal electricity supply undertakings in the Melbourne metropolitan area shall be transferred to its ownership.

The plan anticipates the connection to the S.E.C. supply of about 178,000 additional consumers outside the metropolitan area. This figure includes 60,000 existing homes without supply, 22,000 homes receiving a supply from local electricity undertakings, 60,000 new country homes which are expected to be built during the period, and at least 36,000 industrial and commercial consumers. It is expected that not more than 15,000 homes in the State will then be without electricity.

In addition to the taking over of metropolitan municipal electricity undertakings, some 48 small local undertakings will be acquired.

BRAZILIAN IMPORT TRADE

Increasing Purchases of Electrical Material

From Our Rio Correspondent

THE overall value of Brazil's imports of electrical machinery and apparatus declined slightly between 1949 and 1950 from £21,880,160 to £21,759,760 during the latter year, but increased sharply during the first seven months of 1951 to £21,124,620. All classes showed considerable increases in 1951, but the general tendency has been for imports of radio apparatus and accessories, electric lifts, and parts for electrical installations to decline as local manufactures expanded.

The value of imports of British electrical goods and apparatus rose from £1,020,000 in 1949 to £1,825,000 in 1950. Detailed statistics are not yet available for 1951, but comparing the first eight months of 1950 and 1951 the total value of imports of all classes of merchandise from Great Britain increased by £9,086,860 in 1951, to £40,955,520.

German and French Competition

Great Britain still ranks next to the United States as Brazil's principal source of foreign supplies, but Germany and France are rapidly improving their position, having increased sales to Brazil by £17,413,020 and £16,498,680 respectively during the first eight months of 1951. Each of these countries has a trade agreement with Brazil, scheduling exports to the annual value of U.S. $115 million and $106 million, respectively, during twelve months. The Anglo-Brazilian Agreement expired in June, 1951, and has not been renewed, as the British negotiators were of opinion that greater benefits would result from free commercial exchanges, unhampered by schedules.

Great Britain's share of Brazil's total purchases in Europe dropped from 12·33 to 9·62 per cent during the first half of 1951, while Germany's proportion increased from 1·74 to 3·88 per cent, and that of France from 4·66 to 5·57.

During the last quarter of 1951 the Bank of Brazil issued 162 licences for the importation of electrical material (valued at £374,107) from the United Kingdom. Permits cover motors, £41,878; generator groups, £41,717; accessories for electrical installations, £68,430; telephone material, £4,612; radio apparatus and accessories, £75,935.

As Brazil lacks invisible exports her capacity to buy abroad is limited by her sales. It is essential, therefore, to maintain British purchases in Brazil if exports from the United Kingdom are to remain at a high level. During the first eight months of 1951 the value of Britain's imports from Brazil reached £50,004,980, an increase of £21,314,940 compared with the corresponding period of 1950. Cotton, a seasonal product, accounted for approximately £30 million of the 1951 total. Towards the end of the year sales to the United Kingdom usually fall off, but recover after the first quarter of the following year, when the new cotton crop comes on the market. Thus, relatively few licences were issued to export Brazilian products to Britain between October and December, whereas a large number of permits were granted to ship coffee, skins, tobacco and foodstuffs to other countries in Europe.

Electrical Developments

The Brazilian Congress has authorized a credit, equivalent to £14 million, towards the cost of improving light and power services in Manaos.

The National Railway Department is calling for tenders to supply and install equipment for the 20,000 kW thermo-electric station at Candiota, Rio Grande do Sul. The station will supply power for the electrification of the State railway.

A 45,000 kW thermo-electric station is to be built at Charqueadas, Rio Grande do Sul.

The President of the Republic has signed a decree authorizing the Sao Paulo Tramway & Power Company to install, in the neighbourhood of its Cubatao station, six additional hydro-electric generator sets, with a capacity of 75,000 kVA each.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Crabtree Electrical Industries, Ltd., has declared an interim ordinary dividend of 7½ per cent (against 5 per cent). The directors state that the decision to raise the interim dividend has been made in order to achieve more even distribution between interim and final dividends, and it should not be taken as an indication of their intention to recommend an increased total distribution for the year.

The Automatic Telephone & Electric Co., Ltd.—Provisional allotment letters have now been posted for the issue of 544,000 £1 ordinary shares at 45s each. As reported in our last issue the shares are offered to ordinary and deferred stockholders in the proportion of two new shares for each £5 of stock held. The net proceeds of the issue are estimated to amount to £1,191,500 and they will be utilized in repaying the company's bank overdraft, which amounts to approximately £600,000, and in expanding production and the furtherance of overseas business.

Associated Electrical Industries, Ltd.—In connection with the issue of 2,217,649 ordinary shares at 60s per share, the International General Electric Co. Inc. (of New York) has issued a statement to the effect that it intends to take up part of the A.E.I. "rights" to which it is entitled and that it has placed the balance privately.

Hoover, Ltd., report that group profits for 1951 amounted to £3,014,894, compared with £2,475,271 for 1950. Taxation absorbed £1,268,739 (£961,006), and the group net profit was £1,212,508 (£1,071,081), of which £1,125,138 (£1,024,534) was attributable to the members of Hoover, Ltd. The final ordinary dividend is 25 per cent, making 35 per cent for the year. For the previous year the total distribution was 37½ per cent, of which the final dividend of 22½ per cent was paid on capital increased by a 100 per cent scrip bonus. The dividend on the "A" ordinary 1s shares is also raised from 2s 1d to 3s 3d.

New Companies

Willesden Transformer (Assemblies), Ltd.—Registered 2nd February. Capital £100. Manufacturers and assemblers of electrical transformers and electrical and radio components of all kinds, etc. Directors: L. Mechulam, director of Willesden Transformer Co., Ltd.; and Miss L. Barritt. Secretary: Miss L. Barritt. Regd. office: No. 19 Building, West End, Yeading Lane, Northolt, Middx.

Increases of Capital

Z Electric Lamp & Supplies Co., Ltd.—Increased by £40,000, in £1 ordinary shares, beyond the registered capital of £40,000.

G. K. Lancaster (London), Ltd.—Increased by £1,000, in 500 ordinary and 500 6 per cent cumulative preference shares of £1 each, beyond the registered capital of £1,500.

Liquidations

Electrical & Associated Services (Mumbles), Ltd.—(In voluntary liquidation). Particulars of claims by 29th February to the liquidator, Mr. B. Baddiel, 20, Walter Road, Swansea.

Wellgale Electrical Co., Ltd.—(Creditors' voluntary winding-up). Particulars of claims by 31st March to the liquidator, Mr. K. R. Cork, 19, Eastcheap, London, E.C.3.

Bankruptcies

R. G. K. Dale and **W. B. Martin,** electrical contractors, lately carrying on business as "Martindale" at 77, Meneage Street, Helston, Cornwall.—Receiving order made 24th January on a creditor's petition. First meeting held 12th February. Public examination 21st February at the Town Hall, Truro.

I. Jackson, residing and formerly carrying on business at 103, Station Road, Sutton Coldfield, under the style of Jacksons Electrical Supplies.—First meeting held 13th February. Public examination 19th March at the Court House, Corporation Street, Birmingham.

T. D. Long, carrying on business at 664, Halifax Road, Buttershaw, near Bradford, electrical contractor.—Receiving order made 6th February on a creditor's petition. First meeting 15th February at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford. Public examination 14th March at the County Court House, Manor Row, Bradford.

F. H. Bell, 21, Queen Street, Kidsgrove, Stoke-on-Trent, formerly carrying on business at 4, Attwood Street, Stoke-on-Trent, electrical engineer.—Receiving order made 4th February on debtor's own petition.

STOCKS and SHARES

THE Stock Exchange, in company with other exchanges in the City, is closed to-day (Friday), the day of the late King's funeral; in advance, business in stocks and shares had become reduced to meagre proportions. Prices in the market for British Government and gilt-edged stocks have undergone a moderate reaction. Amongst industrial stocks and shares, there has been a moderate amount of buying, although the near prospect of the Budget is necessarily a restraining influence. Several new issues of substantial amount are known to be on the way.

Automatic Telephone Offer

The new £1 ordinary shares offered to present ordinary and deferred stockholders of the Automatic Telephone & Electric Co. opened this week at a premium of 6s 3d on the issue price of 54s. Later, the premium went back to 5s 9d. Nearly £1,200,000 is being raised by the issue. It will be used in repaying bank overdrafts and in expanding activities at home and abroad. On the new shares, which are being allotted in the proportion of two for every five stock units held, the first instalment of £1 is due on the 22nd this month, and the balance by 4th April. They are not entitled to the dividend for 1951, but will otherwise rank equally with the old ordinary stock. The company anticipates that although the past year's profits will be less than the record preceding results, they will be satisfactory and adequate to maintain the distribution at the rate of 15 per cent. On that basis, the indicated return on the new shares at an all-in price of 51s 3d is £5 17s per cent on the money. The old shares, ex rights, are 51s 3d middle.

New Issues

With the routine selling of "rights" in progress, and with the development of further constraint in new investment business, the premium on Associated Electrical Industries new £1 ordinary shares eased to a trifle under 10s on the price of 60s at which they are offered to shareholders. This amount, incidentally, is payable in full by Monday next, the 18th. Allotments may be renounced up to the end of March, which means that until then the new shares can be acquired without payment of the 2 per cent transfer-stamp duty. This saving represents about 1s 3d per share, so that, although they are not entitled to the final dividend for 1951, the new shares are estimated to be a better proposition, from the buyer's point of view, than are the old shares standing about 2s higher. Assuming a 20 per cent total dividend for the current year, the indicated yield on the new is now 5¾ per cent. It is not long since buyers were prepared to invest in the shares on a yield basis of not much over 4 per cent. The premium on Electric & Musical Industries new 10s shares rose to 4s before going back to 3s 6d.

B.I.C.C. Capital

British Insulated Callender's Cables' proposal to raise the authorized capital by five million new £1 ordinary shares has been duly authorized by shareholders. Subject to the consent of the Capital Issues Committee, the company intends to offer shares as rights to existing holders "at a suitable time and price."

Price Movements on the Week

De la Rue shares at 32s 6d are 2s 6d up. Cable & Wireless ordinary at 120½, and Oriental Telephone at 44s are both better. Anglo-American Telegraph "B" stock has risen several points to 11¾ on vague calculations of what the break-up value of the stock may be. Hoovers recovered to 25s and International Combustion to 19s 9d. Falls have occurred in Walsall Conduits, 48s 9d, and in Anglo-American Telegraph "A", 86, and ordinary, 58. In the heavy group, Babcock & Wilcox, 67s 6d, are 1s 3d down. Amongst other declines, E. K. Cole, 15s, Hall Telephone Accessories, 11s 6d, Revo, 37s 6d, and Telegraph Constructions, 35s, have gone back 1s or so. The general tendency has been on the dull side; in the greater number of cases, the falls have not exceeded 6d per share.

Yield Basis

Before business as a whole came under a cloud last week, the electrical equipment market had points of particular interest in the heaviness of General Electric shares, and to a lesser extent, in English Electrics. After declining steadily, in company with most other industrials, from 91s 6d to 83s during the course of January, General Electrics dropped with some abruptness to 80s 3d. The movement was accompanied by unsubstantiated talk of a coming issue: but it was thought, also, to be not wholly unconnected with the competitive influence of a prospective yield of 5¾ per cent from the A.E.I. new shares. At 80s the return on G.E.C.'s last payment of 22½ per cent is still a little less than that. English Electric £1 shares came down concurrently to about 56s, at which the indicated yield remains about 5½ per cent. Big new issues of ordinary shares on bonus terms are apt, in this unenterprising state of markets, to push here and there a prominent industrial share out of line with its fellows. If the anomaly persists for any length of time, it must be expected to exert some influence over the standing of others of equal rank.

NEXT WEEK'S EVENTS

Monday, 18th February

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "The Cavity Magnetron and Radar," by Prof. J. Sayers.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Protection of Electrical Power Systems," by H. Leyburn and C. H. W. Lackey.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "Characteristics and Control of Rectifier-Motor Variable-Speed Drives," by P. Bingley.

LONDON.—Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "Modern Insulating Materials."

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio & Measurements Group. "Design of a Practical D.C. Amplifier based on the Second-Harmonic Type of Magnetic Modulator," by S. W. Noble and P. J. Baxendall.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Electric Lighting—A Contractor's Viewpoint," by J. Ashmore.

Tuesday, 19th February

LEEDS.—The University, 6.30 p.m. I.E.E. North Midland Utilization Group. "Electrical Control of Dangerous Machinery and Processes: Part III, Remote Supervisory Control," by W. Fordham Cooper.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "The Automatic Compensation of Zero-Drift Errors in Direct-Coupled Feedback Systems," by F. A. Summerlin. "High-Gain D.C. Amplifiers," by K. Kandiah and D. E. Brown. "Design of a Practical D.C. Amplifier based on the Second-Harmonic Type of Magnetic Modulator," by S. W. Noble and P. J. Baxendall.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Scope and Application of Metal Rectifiers," by D. Ashby.

At the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institute of Fuel. "An Investigation of Whole-House Heating," by F. C. Lant and Dr. J. C. Weston.

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 p.m. Junior Institution of Engineers, Sheffield Section. Presidential address. "Enterprise in Engineering," by Air Commodore F. R. Banks.

STAFFORD.—At the English Electric Co.'s Works, 7.15 p.m. I.E.E. South Midland Students' Section. "Hydrogen Cooled Alternators," by T. O. Jones.

Wednesday, 20th February

CARDIFF.—A.S.E.E. South Wales Branch. Afternoon tour of "Atlas" Lamp Works, Merthyr Tydfil. Central Y.M.C.A., 6.30 p.m. Business meeting.

COVENTRY.—Technical College, 7.15 p.m. A.S.E.E. Coventry Branch. "Problems of Large Store Electrical Equipment," by A. W. Jervis.

HULL.—Y.E.B., Ferensway, 7.30 p.m. I.E.E. North Midland Centre. District meeting. "Electrical Control of Dangerous Machinery and Processes: Part II, Electrically Interlocked Guards on Machines," by W. Fordham Cooper.

ILMINSTER.—At the Standard Telephone Works Canteen, 4 p.m. I.E.E. South-Western Sub-Centre. Lecture on "The Structure, Electrical Properties and Applications of the Barium-Titanate Class of Ceramic Materials," by Prof. Willis Jackson.

LONDON.—I.E.E. London Students' Section, 2 p.m. Visit to Carreras, Ltd., Arcadia Works, N.W.1.

London School of Hygiene & Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "Search Radar for Civil Aircraft," by P. L. Stride.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "A Review of Some Television Pick-up Tubes," by Dr. J. D. McGee.

Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Cold Cathode Lighting," by J. S. Smythe.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Metadynes," by A. A. L. Bentall.

Thursday, 21st February

BIRMINGHAM.—Midland Institute. I.E.E. South Midland Centre. "Some Fuel and Power Projects," by Dr. H. Roxbee Cox. (Joint meeting with the Institutions of Civil and Mechanical Engineers.)

CHELTENHAM.—Cadena Café, High Street, 6.15 p.m. I.E.S. Gloucester & Cheltenham Centre. "Lighting of the New House of Commons," by C. Dykes Brown.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "The Electrical Equipment of the Erne Hydro-Stations," by J. B. S. Lawler, J. A. V. McEvoy, S. E. O'Neill and B. Unden.

LINCOLN.—Duke of Wellington Hotel, Broadgate, 7.15 p.m. I.E.E. East Midland Centre. District meeting. "The Protection of Electrical Power Systems," by H. Leyburn and C. H. W. Lackey.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery," by J. C. Macfarlane, Dr. J. W. Macfarlane and W. J. Macfarlane.

Caxton Hall, S.W.1, 2.30 p.m. Diesel Engine Users' Association. Informal discussion on "Operating Problems."

University College, Gower Street, W.C.1, 6 p.m. Presentation of Technical Information Discussion Group. "The Teaching of P.T.I.," by B. C. Brookes.

MAIDSTONE.—Royal Star Hotel, 8 p.m. A.S.E.E. Kent Branch. Lecture.

SOUTHAMPTON.—Polygon Hotel, 7 for 7.30 p.m. I.E.E. Southern Centre. Annual dinner and dance.

Friday, 22nd February

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "Engineering Graduation Theses at the University of Cape Town," opened by Prof. B. L. Goodlet.

Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Research Association. Annual luncheon (postponed from 8th February).

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. "Lessons of the Anglo-American Productivity Reports," by R. G. Hooker.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of each specification (2s 8d each including postage) will be obtainable after 26th March from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

1813[illegible]. General Electric Co., Ltd., Nelson, E. H., and Power, B.—Electric discharge lamps. 26th June, 1948. (669022)

3085[illegible]. Compagnie Générale de Télégraphie sans Fil.—Velocity modulation devices. 16th November, 1945. (669024)

3255[illegible]. Raytheon Manufacturing Co.—Electron discharge devices. 3rd December, 1945. (669024.)

1946

3319[illegible]. Marconi's Wireless Telegraph Co., Ltd.—Phosphors and luminescent screens. 8th November, 1946. (669025)

1947

23802. British Thomson-Houston Co., Ltd.—Pulse discriminating circuits. 28th August, 1947. (669031.)

29107. Standard Telephones & Cables, Ltd.—Gas discharge device. 31st October, 1947. (669032.)

30453. General Electric Co., Ltd., and Nelson, E. H.—Electric discharge lamps having a gas filling. 26th October, 1948. (669033.)

31940. Compagnie Générale de Télégraphie sans Fil.—Focusing devices for electron microscopes. 3rd December, 1947. (669034.)

33315. British Thomson-Houston Co., Ltd.—Production of electric oscillations in pulse transmission systems. 17th December, 1947. (669035.)

33458. British Thomson-Houston Co., Ltd.—Electric discharge lamps. 18th December, 1947. (669036.)

1948

6128. Radio Corporation of America.—Electronic calculating device. 27th February, 1948. (668824.)

9912. Marconi's Wireless Telegraph Co., Ltd., and Price, T. H.—Thermionic valve amplifiers. 1st December, 1948. (668825.)

12917. Office National d'Etudes et de Recherches Aeronautiques.—Devices using electrical strain gauges. 11th May, 1948. (669085.)

15149. Standard Telephones & Cables, Ltd.—Electron discharge apparatus. 4th June, 1948. (668827.)

16346. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Thermal regenerators. 17th June, 1948. (669040.)

18279. General Electric Co., Ltd., and Hemmings, F. W.—Means for carrying an electrical conductor through a metal wall. 6th July, 1949. (669041.)

18549. British Thomson-Houston Co., Ltd.—Electric motor control systems. 9th July, 1948. (669042.)

19175. Marconi Instruments, Ltd., Brockelsby, C. F., and Wray, A. G.—Electrical valve circuit arrangements. 20th July, 1948. (668829.)

21370. Ferrario, M., and Barberi, G.—Electricity supply meters. 13th August, 1948. (668831.)

28176. Power Jets (Research & Development), Ltd., Mallinson, D. H., and Lewis, W. G. E.—Gas turbine power plant. 20th October, 1949. (668834.)

28697. British Thomson-Houston Co., Ltd.—Methods and apparatus for heating by high-frequency electromagnetic fields. 4th November, 1948. (668835.)

30561. Faudell, C. L.—Interference suppression circuits for radio and television receiving apparatus. 23rd November, 1949. (668839.)

1949

8788. General Electric Co., Ltd., and Hemmings, F. W.—Means for carrying an electrical conductor through a metal wall. 31st March, 1950. (668852.)

9587. Midgley, A. H.—Time switches. 30th March, 1950. (669062.)

11442. Telephone Manufacturing Co., Ltd.—Electrical communication systems. 28th April, 1950. (668858.)

11460. Office National d'Etudes et de Recherches Aeronautiques.—Thermionic direct current amplifiers. 29th April, 1949. Cognate application 11461, 28th April, 1949. (669064.)

12883. Skoda Works, National Corporation.—Electric furnaces with cylindrical carbon resistors. 13th May, 1949. (669065.)

13273. British Thomson-Houston Co., Ltd.—Electric refrigerator. 18th May, 1949. (669067.)

15475. Standard Telephones & Cables, Ltd.—Facsimile transmission systems and apparatus. 10th June, 1949. (668865.)

15516. Philips Electrical, Ltd.—Electric discharge tubes. 10th June, 1949. (669068.)

15643. Kaelin, P.—Telephone sets. 13th June, 1949. (669069.)

16196. Horstmann Gear Co., Ltd., Horstmann, F. O. and Horstmann, R. B.—Time controllers for electric switches and valves. 17th May, 1950. (668868.)

16583. National Research Development Corporation.—Automatic frequency control circuit arrangements. 6th July, 1950. (669113.)

16775. Ekco-Ensign Electric, Ltd., and de Boo, W.—Holders for tubular electric lamps. 23rd June, 1950. (669073.)

17469. Smith & Sons (England), Ltd., S.—Remote indicating or control devices. 28th June, 1950. (669116.)

18877. Metropolitan-Vickers Electrical Co., Ltd.—Light- and heat-sensitive electric cells. 25th May, 1950. (669121.)

20205. Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges et Camargue.—Electrolysis cell, in particular for the electrolytic refining of aluminium. 3rd August, 1949. (668875.)

20911. Stevens, A. H. (Syntron Co.).—Electromagnetic vibrator. 11th August, 1949. (669126.)

21032. Imperial Chemical Industries, Ltd., and Jacob, B.—Insulated electrical conductors. 14th August, 1950. (669127.)

21323. Dehn, S. G. (Hunter, E. T.).—Manufacture of inflatable conduit cores. 16th August, 1949. (668876.)

22433. Hewittic Soc. A.R.L.—Control systems for electric motors. 29th August, 1949. (669077.)

22784. Standard Telephones & Cables, Ltd.—Thermosensitive electric protective devices. 1st September, 1950. (669136.)

23093. General Electric Co., Ltd.—Pulse code modulation signal transmitting systems. 30th August, 1950. (668884.)

24098. Greaves, B. B.—Magnetic separators. 17th August, 1950. (669139.)

24389. Hardiman, L. F.—Standard electric lamps combined with articles of furniture. 11th September, 1950. (669141.)

25437. General Motors Corporation.—Stator for dynamo-electric machines and methods of making the same. 4th October, 1949. (669078.)

25551. Koehler Manufacturing Co.—Battery operated lamps. 4th October, 1949. (669143.)

25940. British Federal Welder & Machine Co., Ltd., and Tribe, T. F.—Electric switches having sequentially operated contacts. 10th October, 1950. (669079.)

26410. Lord Manufacturing Co.—Resilient mountings. 11th October, 1949. (669145.)

27017. Jones & Sons (Machine Parts), Ltd., G. E., and Bailey, J. G.—Electrical contact plug devices. 19th September, 1950. (668887.)

27080. Telephone Manufacturing Co., Ltd.—Telephone apparatus. 3rd October, 1950. (669149.)

27254. Lamont, K.—Circuits for the generation of electrical oscillations. 20th October, 1950. (669210.)

27817. Carnegie-Illinois Steel Corporation.—Method of electrotinning continuous steel strip. 31st October, 1949. (668890.)

28342. Sluijter, J. G. — Electric dry shaver. 4th November, 1949. Cognate application 28343, 16th March, 1949. (669152.)

28925. Sulzer Freres Soc. Anon.—Fractionating columns and similar counter-current contacting apparatus. 11th November, 1949. (668891.)

28948. Rollinson, E. W. (Thompson Products, Inc.).—Control devices for solenoid operated engine valves. 11th November, 1949. (669213.)

29206. Standard Telephones & Cables, Ltd.—Electrical capacitative elements. 12th December, 1950. (669154.)

29245. Associated Electrical Industries, Ltd.—Integrating apparatus. 18th September, 1950. (668892.)

30598. General Electric Co., Ltd., and Hanson, W. H.—Remote control and protective systems for electrical apparatus. 21st November, 1950. (668895.)

30741. British Thomson-Houston Co., Ltd.—Methods of insulating electrical devices. 30th November, 1949. (669158.)

31434. Marck, G. J. Van.—Electric motors with axially movable rotors. 7th December, 1949. (669161.)

31661. British Insulated Callender's Cables, Ltd., and Hilyer, F. G.—Electric fuses of the cartridge type. 8th December, 1950. (668898.)

32932. Etablissements Merlin & Gerin.—Heavy-current air-break electrical switch contacts. 23rd December, 1949. (668900.)

1950

46. Elektrokemisk Aktieselskapet.—Continuous electrodes for electric furnaces. 2nd January, 1950. (669170.)

1227. Soc. Anon pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz et Silva.—Lighting fixtures. 17th January, 1950. (669180.)

1971. Sperry Corporation.—Electromagnetic energy directional coupling devices for ultra high-frequency waveguides. 25th January, 1950. (668927.)

2777. Metropolitan-Vickers Electrical Co., Ltd. (Compagnie Générale de Radiologie).—X-ray tubes. 2nd February, 1950. (668933.)

3757. Philips Electrical Industries, Ltd.—Circuit arrangements for producing high direct voltages. 14th February, 1950. (668947.)

4414. Standard Telephones & Cables, Ltd.—Coaxial conductor cables. 21st February, 1950. (668950.)

6697. Allmanna Svenska Elektriska Aktiebolaget.—Arrangement in electric cookers. 17th March, 1950. (668971.)

7039. Dumont Laboratories, Inc., A. B.—Amplifier circuit. 21st March, 1950. (668974.)

7426. Philips Electrical Industries, Ltd.—Electric discharge tubes. 24th March, 1950. (668906.)

8664. Standard Telephones & Cables, Ltd.—Radio diversity receiving systems. 6th April, 1950. (668913.)

8990. Allmanna Svenska Elektriska Aktiebolaget.—Arrangement for comparing two periodically recurring cycles of events for measuring or regulating purposes. 12th April, 1950. (668914.)

10995. Heading, C. T. W.—Electric transformer clamps. 3rd May, 1950. (668999.)

11551. Shacklock, Ltd., H. E.—Electric ranges. 9th May, 1950. (668920.)

12166. Allmanna Svenska Elektriska Aktiebolaget.—Electrical surge divertors. 16th May, 1950. (669000.)

12205. British Thomson-Houston Co., Ltd.—Air circulation control systems for refrigerators. 16th May, 1950. (669001.)

18885. Veale, L.—Control of the charging of electric thermal storage heaters. 28th July, 1950. (669030.)

20756. British Thomson-Houston Co., Ltd.—Flame detectors. 22nd August, 1950. (669021.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 6th March:—

BERESFORD STORK. No. 691,311, Class 7. Centrifugal pumps, submersible electrically-driven pumps, sump pumps for draining cellars and suds pumps.—James Beresford & Son, Ltd., Kitts Green Works, Mackadown Lane, Marston Green, Birmingham.

ELA. No. 698,528, Class 7. Incubators for use in medical work and in scientific research.—Electricals, Ltd., 14, Claremont Place, Newcastle-on-Tyne, 2.

ALLIS-CHALMERS. No. B685,307, Class 9. Electrical apparatus and instruments and parts thereof, all included in Class 9.—Allis-Chalmers Manufacturing Co., Milwaukee, Wisconsin, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5–9, Quality Court, Chancery Lane, London, W.C.2.

PLASTRONIC. No. 699,093, Class 9. Electric flash apparatus for use in photography.—H. Godfrey, 108, Horseferry Road, London, S.W.1.

HUMICON. No. 703,442, Class 9. Hygrometers.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, London, W.C.2.

TWYLITE. No. 703,630, Class 9. Electric jugs, electric irons, and parts included in Class 9.—L. N. Butcher, trading as Twylite Trading Co., 111, Little Lonsdale Street, Melbourne, Australia. Address for service, c/o Gill, Jennings & Every, 51 and 52, Chancery Lane, London, W.C.2.

Gas Turbine Courses

THE School of Gas Turbine Technology is holding three detailed and highly specialized courses this summer. Normally, courses held at the School cover the overall design as comprehensively as possible in the space of three weeks. Each of the three special courses, however, will devote a whole week to dealing with one component in detail. These special courses are primarily intended for existing design staff who are preferably already engaged in design work.

The first course, from 30th June to 4th July, will be on the theory and design of compressors; the second, from 7th July to the 11th, on the combustion and design of heat exchangers; and the third, from 14th July to the 18th, on the theory and design of turbines.

Other courses arranged for the remainder of 1952 include the design and applications of industrial gas turbines (three weeks from 15th April to 2nd May, and three weeks from 27th October to 14th November).

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia. — ADELAIDE. — 21st February. Engineering and Water Supply Department. Supply of five pumping units, including electric motors and ancillary equipment, for the Berri irrigation and domestic water supply. (C.R.E. 4380/52. Ten/3582.)*

Brazil.—SAO PAULO.—17th March. Secretariat of Transport and Public Works. Supply of twenty-five diesel-electric locomotives and various types of wagons. (C.R.E. 4552/52. Ten/3572.)*

Broadstairs and St. Peters.—6th March. U.D.C. General stores including electric decoration lamps for one year. K. Josey, surveyor, Pierremont Hall, Broadstairs.

East Riding.—County Council. Contractors, specialist firms and tradesmen desirous of having their names considered for inclusion in a revised list of contractors for use in the County Architect's Department should submit applications to the county architect. (See this issue.)

Tavistock.—3rd March. U.D.C. Street lighting equipment. (See this issue.)

Uruguay. — MONTEVIDEO. — 24th March. Administracion General de las Usinas Electricas y los Telefonos del Estado. Supply of 31,500 metres of subterranean armoured cables and 135 cable boxes. (C.R.E. 4633/52. Ten/3580.)*

Wanstead and Woodford.—25th February. Corporation. Street lighting equipment. (See this issue.)

West Riding.—25th February. County Council. Electrical installations in schools at Purlwell Lane, Batley, and Gawthorpe, Ossett. County architect, "Bishopgarth," Westfield Road, Wakefield.

Whittingham (Lancs). — 10th March. Hospital Management Committee. Electric lamps for one year. Secretary of the Committee, Whittingham Hospital, near Preston.

ORDERS PLACED

Australia.—N.S.W. Railways. Laying and jointing 33 kV underground cables, White Bay to Meeks Road (£66,779).—British Insulated Callender's Cables, Ltd. Switchgear, Prince Alfred and Bondi Junction substations (£167,089).—Australian General Electric Pty., Ltd. (for Metropolitan-Vickers Electrical Export Co., Ltd.).

Durham.—County Education Committee. Electrical installation at Horden Colliery County and Horden Girls' Modern School (£6,497).—Doves (Darlington), Ltd. (in lieu of tender withdrawn). Electrical installations at Hartlepool Galley's Field Modern School (£249) and Spennymoor King Street County School (£2,303).—North of England Engineering & Electrical Co.

Gateshead.—Town Council. Stage 3 of street lighting electrification scheme. Supply of 275 enclosed type lanterns (£2,687), transformers (£1,186) and capacitors (£378).—G.E.C. Reinforced concrete columns (£5,276).—Revo.

Glasgow.—Corporation Education Committee. Forty-two receiver installations each including a matching unit and six single loudspeakers and classroom control units (£4,210).—Ultra Electric, Ltd. Supply of 16 Phillips "Consolettes," each complete with six loudspeakers and classroom control units (£1,695).—C. W. Cameron, Ltd.

Luton.—Housing and Estates Committee. Recommended. Installation of electrical services in six blocks of flats to be built on the Farley Hill estate (£3,033).—Williams & Richardson, Ltd. Electrical services in 136 houses on the same estate (£4,540).—Scientific Radio Service Co., Ltd. Supply of 72 electric water heaters (£2,534).—Alliance Wholesale, Ltd.

Peterborough. — East Anglian Regional Hospital Board. Recommended. Electrical installation work in out-patients' department at Peterborough and District Memorial Hospital (£1,948).—Grensells, Ltd.

South Shields. — Education Committee. Rewiring Mowbray County Junior Mixed School (£1,259).—A. Robertson, Ltd.

Southport.—Estates Committee. Electrical installations in 50 houses on the Heathfield Road site (£1,168).—Graham & Caddick, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bath.—First phase of halls of residence scheme at Training College, Newton Park; A. J. Taylor & Partners, architects, 4/5, Bridge Street.

Bathavon.—Houses (100), Red Post, Peasedown, for R.D.C.; W. A. Williams, architect, 5, Wood Street, Bath.

Brierley Hill.—Bungalows (66) and hostel for aged at Swan Lane estate; borough surveyor.

Brighton.—Flats, Lewes Road (£106,000); Sylvan Hall estate (£46,000) and Hollingdean estate (£73,000); borough surveyor.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Bucklow (Ches).—Houses (25), Moss Lane and Worthington Avenue and 48 at Hall Lane, Partington, for R.D.C.; W. A. Costello, 212, Northenden Road, Sale, Cheshire.

Cardiff. — Four-storey municipal offices, Bridge Street; city engineer, City Hall.

Chelmsford.—Houses (42), South Hanningfield; estate manager, R.D.C. Offices, New London Road.

Cheltenham.—Extensions and alterations to block at St. Paul's Hospital, Swindon Road; L. W. Barnard & Partners, architects to Management Committee, 13, Imperial Square, Cheltenham.

Chester-le-Street.—Houses on three acres of land; U.D.C. surveyor.

Chesterton.—Dwellings (63), on four sites; H. Jackson, architect to R.D.C., 93, Hartington Grove, Cambridge.

Cockermouth.—Community centre; U.D.C. surveyor.

Coulsdon and Purley.—Houses (34), on site near Coulsdon North Station; surveyor, Urban Council Offices, Purley.

Cumberland.—Additions to Newton Rigg Farm School (revised scheme) for Cumberland and Westmorland Joint Agricultural Committee (£24,000); county architect, Portland Square, Carlisle.

Dagenham. — Extensions to York House Training Home; R. J. Page, architect, 47, North Hill, Colchester.

Daventry. — Houses for R.D.C.: Long Buckby (8); Tandy & Richards, Northampton. Yelvertoft (6); Cockram & Griffin, Barby, Northants.

Denby Dale.—New fire station at Skelmanthorpe; H. Bennett, county architect, Wakefield.

Derwent.—Houses (50), Barlby, Yorks; E. V. Hunter, architect to R.D.C., 9, Minster Yard, York.

Durham.—Rural domestic economy centre at the Houghall School of Agriculture (£15,700); D. Glen, Ltd., builders, Albert Road, Jarrow.

Ealing.—Houses and flats (154), Northolt Park scheme; town clerk, Town Hall, W.5.

Eastbourne.—Houses (78), Langney Village; borough engineer.

Esher.—Dwellings (64), Winston Drive estate, Stoke d'Abernon; U.D.C. surveyor, Council Offices, Esher, Surrey.

Essex.—Voluntary primary school, Epping Green, and junior and infants' school, Debden estate, Loughton; county architect, County Hall, Chelmsford.

Gateshead.—Police houses for the T.C.; H. J. Cook, chief architect, Municipal Buildings.

Hebburn-on-Tyne.—Terrace houses (72), Prince Consort Road; U.D.C. surveyor.

Heywood.—Houses (26) and 4 maisonnettes, Gooden Farm estate; Wm. Townson & Sons, Ltd., Bolton.

Hornchurch.—Dwellings (56); P. L. Cox, clerk to U.D.C., Council Offices.

Ketton.—Houses (10) for R.D.C.; W. J. Hemmings, architect, Broad Street, Stamford, Lincs.

Kidderminster.—Houses (140), C[illegible]ndhu estate; Shipway & Partners, Ltd., 1294, Bristol Road South, Birmingham.

London. — South Lambeth. — [illegible]ctory, Stewarts Road; Auto-Combustions ([illegible]ndon), Ltd., 318, Clapham Road, S.W.9.

Stoke Newington. — Library, Wo[illegible]berry Down; Gold & Aldridge, architects, 42, [illegible]urch Street, Baldock.

Wandsworth.—Dwellings (115), flats [illegible] and day nursery, Clapham Crescent housing s[illegible]eme; H. Baily, Sutcliffe & Associates, architec[illegible] 31a, John Adam Street, W.C.2.

Manchester.—Factory at Wythenshaw[illegible] estate for Tie Weaving Industries, Ltd., Blac[illegible]burn; Drury & Gomersall, architects, 15, Oxford Road, Manchester.

Market Bosworth (Leics).—House[illegible] (50); R.D.C. architect.

Middlewich (Ches).—Houses (16), Chadwick Fields estate, for U.D.C.; G. F. Pugh, Wheelock Street.

Newcastle - on - Tyne. — Alterations to "Moorlands" (£14,000); R. Bowey & Son, Ltd., builders, Back Raby Street, Newcastle.

Northumberland.—Old people's home at Tweedmouth (£18,000); Berwick Building Co., builders, Berwick.

Nottingham.—Houses (300), Bramcote Lane estate; city engineer.

Otley.—Houses (20), Weston estate, for U.D.C.; Tom Smith, Ltd., Otley.

Poole.—Bus station, High Street and Kingsland Crescent; Hants & Dorset Motor Services, Ltd., Bath Road, Bournemouth.

Preston.—Houses (90), Larches estate, Ashton; borough surveyor.

Romford.—Additional factory; Colvern, Ltd., Mawneys Road.

Houses (451), Cross Road scheme; town clerk, Town Hall.

St. Ives.—Houses (18) and bungalows (6), Warboys; R.D.C. architect, St. Ives, Hunts.

Sale.—Houses (14) and 32 flats at Baguley Lane site; F. Entwisle & Co., Ltd., Broadway, Davyhulme, Manchester.

Sheffield.—Development of estate at Hackenthorpe for housing, etc. (first scheme to cover 416 houses); city architect, Town Hall.

Smethwick. — Dwellings (28), Wellington Street and Foundry Lane site; J. Harper & Sons (Blackheath), Ltd., Blackheath, Birmingham.

Spalding.—Houses (42) and bungalows (22); architect to R.D.C., 10, The Crescent, Spalding.

Thornaby-on-Tyne.—Children's home for North Riding C.C.; county architect, County Hall, Northallerton.

Widnes. — Houses (54), Crow Wood; H. Neville Player, architect, Brendan House.

Wrexham.—First phase of girls' grammar school, Ruabon; G. D. Wiles, architect, Grove Park.